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LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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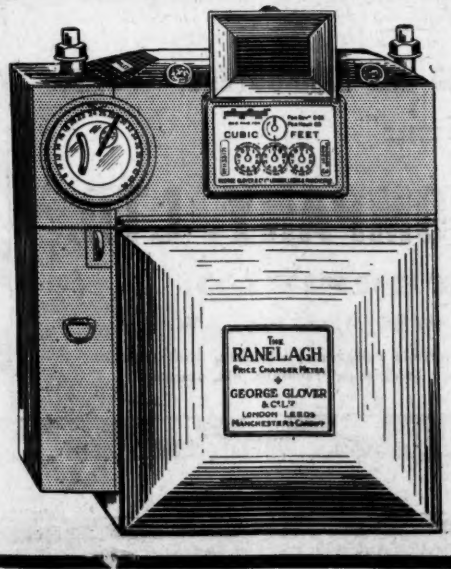

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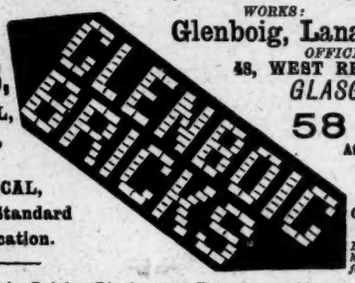

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VOL. CLVIII., No. 3082.] WEDNESDAY, JUNE 7, 1922. [74TH YEAR.

EDITORIAL NOTES.

The Institution Meeting.

We are looking forward with exceptional interest to the annual meeting of the Institution this year; and more particularly because this is since the war the first reception that the professional men of the British gas industry have been able to give their confrères of the Société Technique de l'Industrie du Gaz en France. It is true the members of the Société will not be with us until the Thursday morning; and then there will be the official welcome, and a reply by the distinguished President, M. Ellissen. For that and the succeeding day, the programme will be a full one, including the reception by the President and Mrs. Thos. Hardie, and the visit to Beckton, with luncheon, at the invitation of the Governor (Mr. D. Milne Watson) and the Court of Directors of the Gas Light and Coke Company. Apart from the Institution programme, the European Gas Company will also be the hosts of the visitors. We have mentioned the name of Mr. Thomas Hardie, the President of this year. There is considerable interest in the fact that he has succeeded to this high office through the ordinary route of the junior and senior Vice-Presidencies; and yet his year of office coincides with the first year of his translation to the office of Chief Engineer of the Gas Light and Coke Company. Still another singular point is that his predecessor in the chief engineership of that Company was his predecessor in the Presidential Chair of the Institution. These occurrences have come about without premeditation or design. A good worker, but in public reserved, our friend is one of the highly honoured ones in the professional ranks, and solely through that personal worth and those characteristics which win the esteem of one's fellows.

The meeting on this occasion is to be held at the Institution of Electrical Engineers, Victoria Embankment, from June 21 to 23. The provision for technical consideration and discussion at the meeting is ample; and we are sure it will be of generous merit. The subjects and authors are the guarantee. On the first day there will be the address of the President. A statement will be made on behalf of the Gas Investigation Committee with reference to the research on aeration in atmospheric burners. This investigation marks the return to the study of the behaviour in use of different grades of gas, which was suspended for twelve months in order to allow the research into recording gas calorimeters. The work bears upon questions which will become more urgent if the grades of town gas are varied more widely. The same Committee will submit their Seventh Report; and this will treat of carburetted water-gas plant combined with a waste-heat boiler. This report, it is believed, will usefully supplement the results reported last year for a blue water-gas plant. The report of the Institution Gas Research Fellowship will treat of the liberation as ammonia of nitrogen and sulphur from coal and coke; the authors being Dr. A. C. Monkhouse (Institution Gas Research Fellow) and Prof. J. W. Cobb. The report will deal mainly with the influence of different atmospheres and temperatures on the formation of such constituents as ammonia and sulphuretted hydrogen. There will succeed the report of the Life of Gas-Meters Committee; and here again, judging from past experiences, there will be interest and instruction. The report of the Refractory Materials Research Committee will be presented by Mr. A. E. Broadberry; and contributions to it are being made by Mr. A. T. Green, on the thermal conductivity of refractories at high temperatures, and by Miss D. A. Jones, B.Sc., on the standardization of the after-contraction test. Four papers will complete the bill; and this will suffice. Past experience protests against over-crowding with contributions. Dr. Charles Carpenter will make a contribution on some gas-burners and a moral. The indebtedness of the gas industry to the author in respect of the "Metropolitan" burner (No. 2) will not on that occasion be overlooked. This was the burner which, in the days of illuminating power standards, gave the industry that to which it was entitled in respect of qualitative full measure; it was the burner that helped largely to pave the way to the greater freedom now possessed in respect of calorific power. It looks as though the students of carbonization will find good discussable point in the paper by Dr. Geoffrey Weyman on increasing the rate of carbonization of coal. The contributor is Chemist to the Newcastle-on-Tyne Gas Company, and so in times past has served under the President. Appropriately, in view of the visit on the Friday, there will be a paper describing the reconstruction work at Beckton. The author is Mr. W. B. Leech, the Engineer at that station. Hearty welcome will be given to one of the Gas Referees—Prof. C. V. Boys, F.R.S.—when on Thursday morning he will deal with a recording and integrating gas calorimeter. In every respect the programme promises quality, and a sufficiency for filling the time without that undue pressure which has so often marred the technical proceedings of the Institution, and has caused dissatisfaction and disappointment.

There is not a great deal in the report of the Council that invites comment. But it shows the extensive and variegated technical ground over which the Council and those to whom it delegates certain duties have to keep watch, and take action as is required. The developments in the technical and scientific work of the industry which are the outcome of research and the consequent growth of knowledge are apparent in large sections of the report; and behind it all is material advantage for gas undertakings. The principal parts of the report are given in later columns. One word of congratulation, and another of regret. The membership has now reached 954. Cannot an effort be made to climb to the first four-figure mark this year? Upon the high total already attained, we congratulate the Council, for we have to remember that the gas industry has very close limits in respect of professional scope. The word of regret is in regard to the list of deaths. There are sixteen names—some of men highly distinguished in the gas-engineering ranks of this country and France; all highly honoured in their respective spheres. There is the name of John West among them—gifted, and with a world-wide reputation. There is the Right Hon. Sir Daniel Ford Goddard. But we must not proceed—to do so, all the names would have to be again mentioned.

The Science of Coke Making.

The technicians of the gas industry have been making coke all their working lives, and in the crudest sort of way, because that way involved the least difficulty. Coke is the secondary product of first importance in the balance-sheet of every gas undertaking; and yet its production has received scant scientific study. There has, for instance, been little knowledge in the industry as to the why and the wherefore of differences in structure; and less as to whether any manipulation of the raw material from which coke is made would result in the improvement of the latter. The technical men of the industry, in short, have gone on quite unconscious of the fact that near at hand, with better understanding, there are means—whether practicable or not in daily operation is another question—of controlling the

physical or structural characteristics of coke. The means and the reasons are stated in the paper which Sir George Beilby read before the London Section of the Society of Chemical Industry last week, as well as in the recently issued report of the Fuel Research Board; but to this part of the report only brief reference was made in our review [*ante*, p. 500]. It shows the lax way in which the gas industry has taken up research work, when, with its hundred years and more of history, it is only lately that the science of coke making has been taken in hand, and this by men and an organization not directly identified with the industry.

The most advanced work in this direction has been done at the Fuel Research Station, under the direction of Sir George Beilby, who himself is one of the pioneers in the study of coke structure. There were, of course, individual workers, whose investigations have had directive influence, prior to the systematic investigation at the Fuel Research Station. Among those well known to gas engineers are Lomax, Lessing, E. V. Evans, and Messrs. Sutcliffe and E. C. Evans. The study has vast practical importance to the producers of coke and to both industrial and domestic users. At the Fuel Research Station, the matter has been taken up in a methodical and comprehensive manner; and for the purpose a new system of assay has been elaborated. This method, by which results are ascertained by direct weighing and measurement, is valuable for various purposes. The particulars secured are especially useful in connection with the study of the behaviour of different classes of coal during their carbonization, and of the influence of the fusibility of coal on the ultimate form and structure of the resulting coke. In order to obtain a complete appreciation of the value of the work and of Sir George's paper, one wants to get well in mind one or two fundamental points. The first is that most seams of coal are built-up of bands of varying fusibility, each of which would give different results if carbonized by itself. When coal in the rough is carbonized in gas-retorts, it is often possible to pick out pieces of coke which have obviously resulted from bands of coal of different fusibility. In lightly charged retorts—particularly in continuous vertical ones—the infusible portions often retain their individuality, but are concreted by the fused material into a caked mass. In heavily charged retorts, where the charge is undisturbed from beginning to finish, the effects of general interfusion are more in evidence.

The results of carbonization in the laboratory assay apparatus have thrown a great deal of light on the behaviour of coals of different fusibility in the fine state of division and in homogeneous mixtures; and now the inquiry has been extended into the region of coke structure and as to the means by which it can be modified or controlled. Much information is given in the paper regarding the earlier enlightening work on the subject of micro-structure; and the method of examination adopted in the later work is explained. The observations show that coke structure, however minute, is due to the evolution of gas bubbles from the fused or partially fused coal substance. Now these bubbles can only be blown so long as the mass is sufficiently plastic. This fact places definite limits of time and temperature on the development of the structure, which ceases when decomposition has reached the stage when rigidity of the cell walls has set in; but owing to the complex character of the decomposition of the fusible constituents during carbonization, it is difficult to ascertain the limits of time and temperature at which rigidity begins. However, in the carbonization of coal on an industrial scale in coke-ovens and gas-retorts, the influence of the time element is generally recognized; and Sir George Beilby ventures to hope that the definite association which has now been traced between what occurs during the fusion and frothing stage in carbonization and the ultimate structure of the coke may prove a new starting-point in the inquiries. The frothing plays a very important part in coke structure. Frothing with the formation of large bubbles only occurs when the froth is free to expand without the intervention of solid surfaces against which the bubbles burst, and the gas they contain can escape. This was demonstrated in 1912 by Dr. Lessing, whose pioneer work in this respect Sir George acknowledges. This fundamental feature of carbonization goes far to explain the mechanism of the production of dense coke in modern coke-oven practice where the finely divided coal is tightly packed in the ovens by the application of pressure. In modern coke-oven practice, the advantages of fine crushing and blending of the various brands of one seam or of several distinct seams are only partially recognized as the means by which homogeneity in composition and uniformity of any desired texture in the coke can be secured with certainty. It is hoped that the work that is now in hand will throw useful light on the structure of coke, and on the methods by which this may be modified at will, so as to adapt the fuel more perfectly to the metallurgical and other purposes for which it is produced.

Much has been said about the blending of different coals. What effect does this have? It has been discovered at the Fuel Research Station that the excessive foaming of the more fusible coals could be completely arrested by a totally different method from that of outside restraint which results from confining the coal in a restricted space during carbonization. The method indicated is that which is described as blending, which consists of the intimate mixing of fusible with an infusible or less fusible coal, in proportions which can be determined by a few preliminary trials in the laboratory assay apparatus. When the proper mixture has been arrived at, little or no foaming occurs during carbonization; and the resulting coke occupies a smaller volume than the original coal. It is easily recognized that, by ensuring the shrinkage of the coke, one of the most serious of the difficulties in the carbonization of fusible coals is removed. The idea Sir George tells us has been taken up by other workers, and is being practically applied in various directions.

The mixing of pulverized coke or breeze with fusible coal is a variation of the method. As Mr. E. V. Evans has shown, a good domestic fuel can be obtained by this means, and, in fact, has been produced by the South Metropolitan Gas Company. It is a remarkably homogeneous material, in which the bubble sponge structure is uniformly developed, and on just the right scale for a domestic fuel. Sir George acknowledges that his interest in the micro-structure of coke was greatly stimulated by the remarkable work of Messrs. Sutcliffe and E. C. Evans on the briquetting of pulverized coal as a preliminary to carbonization. This at once appealed to him as a logical sequence of the work at the Fuel Research Station on the blending of coal crushed to a moderate degree of fineness. It has been proved by these pioneers in the work that the control of bubbling and frothing by grinding and blending, which make it possible to develop a reactive surface within the mass, without too great a sacrifice of density and robustness, could be almost indefinitely extended by the briquetting of finely ground coal as a preliminary to carbonization.

The importance of the work upon which Sir George and his staff are engaged was emphasized by Mr. E. C. Evans in the discussion on the paper. He pointed out that the structure of the walls of the cells in the coke plays a tremendous part not only in carbonization, but in chemical reactions. He believes this question of structure is going to be of vital importance in the future. That is a conclusion at which anyone who makes a complete study of the paper will have no difficulty in arriving.

Development of Housing Scheme Experiences.

So far as gas and electricity are concerned in connection with housing projects, their rivalry for adoption will never cease; but we think it may be said that, so far, on balance, gas has obtained the superior part of the business in the already matured and maturing housing schemes. This is on merit alone. Compared with electricity, gas, where installation and supply costs are in respect of both on a commercial basis, has economy on its side right along the line; and in any house—working-class houses especially—its capacity for service is unequalled by the other agent. It has mostly been where the housing authority is largely constituted of members of a local council owning an electricity supply undertaking that houses built under the schemes, which will be in the occupation of people whose incomes are declining, have a dual service for lighting by electricity and for cooking, heating, &c., by gas. Many of these houses were erected when building costs were at their peak, or not far from it. The dual service where adopted increased those costs; and if the expenditure upon the houses and the gas and electricity services is to be profitable, then we are afraid that, with declining incomes, tenants will find the new houses and their equipment too expensive for them, and the ratepayers will have to bear part of the burden, together with probably a loss on the gas and electricity systems.

While there is not the same keenness over the supply of

gas and electricity to housing schemes to-day as formerly—owing to the completion of a large part, a general lessening of activity in the matter, and a numerical abbreviation of original plans through the need for economy—it must not be supposed that the electrical people are taking the greater success of gas at all kindly. They are still seeking, by divers ways and means, to establish themselves in business in less affluent social strata than those in which their existing customers are found. In some cases, the electricity suppliers are, with the lowering of costs for labour or material, offering to make installations on terms that have a far different complexion from those they were suggesting not very long since; and as for the supply itself, there are instances where fixed prices are being offered for unmeasured supply, or at charges which other consumers, if they interest themselves in the matter, may regard as preferential. These are conditions of competition which must not be neglected by business rivals; but we should be very averse to suggesting that gas undertakings should emulate such a foolish policy. It can be carried to a point at which it will kill itself. Apart from such considerations, there are the householders themselves. It will not take them long to find by comparison the disadvantages of attempting to do by electricity all they have previously been doing by gas—perhaps through the prepayment meter system. Just imagine a working man's family doing all the cooking, water heating, and perhaps part of their room heating by electricity, with its costly heat units. As a matter of administrative policy, it is a reactionary and unjustifiable thing to impose upon such tenants through one agent an expense greater than it is necessary for them to bear by the use of another agent. The electricians make much of the use of electricity in dwellings of the employees of electricity suppliers, where the best of supervision is given to appliances, a careful control is maintained over consumption, and the charge per unit is not more than a fraction of a penny. But these are conditions that can be ignored; for they will not obtain generally. And the relative practical capabilities of gas and electricity in the home for the chief purposes for which they are used—particularly where heat is the essential—will always maintain the ascendancy of gas. Many electrical men frankly acknowledge they are outstripped by gas in respect of domestic heating purposes of all kinds, and to an extent which it is hopeless to try to overtake, for the differences are of a physical nature which are not convertible from one state to another by any amount of human ingenuity.

Because of the position of things in connection with the housing schemes to-day, discussable interest in them has not been eliminated. Only the character of the topics has changed somewhat. The long arguments with the housing authorities and the Ministry of Health, and the vexed topic of financial assistance in supplying schemes carried out on virgin land a distance from the existing gas-mains, as well as of a monetary contribution towards the cost of the apparatus installed, which saves some amount of structural expense and the installation of coal-consuming appliances, have more or less come to an end; and now views are being exchanged among the responsible men over practices and experiences. The best of what has been done to suit local conditions and requirements will be the standard for what will be done in the future, or the starting-point of improvement, if experience or invention can suggest it. At the recent auxiliary meeting of the North of England Gas Managers' Association, Mr. W. E. Oulds, of Tynemouth, delivered an address (published to-day) on "Gas as It Affects "Housing Schemes." Gas affects housing schemes beneficially in various ways other than those recounted by the author. Tynemouth has always been well to the fore in good gas work—technical and commercial. The Company had their difficulties over these housing schemes; they also had their struggles with those who exhibited that far too common human characteristic of wanting as much as possible for as little as possible, which is carried oftentimes to the extreme of injustice. In the case of the Tynemouth authorities, however, though the first scheme cannot be said to have been a financial success for the Company, they were in some measure amenable to reason; and "fairly satisfac-"tory terms" were subsequently arranged for other larger schemes. One cannot help in this connection reflecting upon the widely varying disposition, outlook, and appreciation exhibited by different housing authorities. Take the case of Sunderland, Mr. J. E. Morfett stated, in the discussion on the address, that his Company have dealt with no fewer than 1500 houses comprised in eight schemes, and necessitating negotiations with no less than seven different local authorities; and in every case the Company have been fortunate enough to get the local authority to instal gas for lighting, and have secured the street lighting as well. The details regarding the Tynemouth schemes will be found in the address; but from the gas business point of view the houses have the disadvantage that they are near a colliery where cheap fuel can be obtained. In such a case, labour saving, cleanliness, atmospheric sanitation, promptness of operation, and other argumentative points in favour of the use of gas as a fuel, are blown to the four-winds by purse considerations. In such houses, unless the lighting is obtained, there is not much ground for expectation of any considerable gain from gas consumption for other purposes. We shall not, however, hear much more of these matters. Experience is what has now to be carefully watched. And one word on this point. The assured satisfaction of the consumers in these new dwellings is going to be an important trading point in the future. This means reasonable attention to the service, and not unreasonable indolence, on the part of the gas suppliers.

The address dealt with other matters—some of which do not bear more on the housing schemes than upon other classes of gas custom. But still they were not without interest. One had regard to main-laying policy—whether central mains should be laid under roadways, or mains be laid under the footpaths on either side of the street. The question is one which can only be settled by taking account of local circumstances. The laying of main-pipes under the footpaths is a practice that has much to commend it. The pipes are removed from heavy traffic; roadways, which are more strongly constructed to-day, have not to be dug up; the pipes themselves are not subjected to the same amount of vibration, and therefore to fracture; and the services to the houses have to be of shorter length. The point regarding vibration and fracture may in many of these schemes be entirely abandoned, in view of the fact that so generally the houses are off the beaten track of heavy traffic. But anyway there can be no general rule as to roadway or footpath main-laying. Each case must be decided on by local circumstances. The character of the services was a point discussed. Tynemouth seems to have adopted a fairly expensive one. Again, even though only partially adopted, we are not much enamoured of lead piping for gas supply. As to an outside stopcock to every service, this may be considered a superfluous expense. But it is a convenience in the case of cleaning or repairing the service; and it is certainly a protection. By it the gas can be promptly turned off outside a house in case of fire. Nothing can be said against the advantages; and the only disadvantage is the additional cost. There is absolute agreement with the suggestion as to the framing of regulations for gas-fitters and plumbers, as well as with the proposal that all architects and surveyors, who have the preparation of plans and specifications, should be recommended to require that the interior gas-piping should be executed in accordance with the regulations of the gas authorities. Among other matters treated in the address that have general bearing, and no exclusive association with housing schemes, are naphthalene and the corrosion of iron and steel pipes. In connection with the latter matter, we shall probably hear something at the forthcoming Institution meeting from Mr. Taplay as to the simple process with which he has been experimenting for removing hydrocyanic acid from gas, and so one of the most virulent enemies of metal work. Mr. Oulds also gave a short description of the high-pressure gas distribution system in Tynemouth, and noted its main features, including the governing arrangements. However, housing schemes were the main topic, and in connection with them experiences are beginning to tell their positive tale.

Conferences of Gas Salesmen.

IN the last two issues of "The Gas Salesman," editorial reference has been made to the value which district conferences of gas salesmen would have in pooling and circulating practical experiences. In the article which appeared in the supplement last week, allusion was made to the fact that the British Commercial Gas Association had now adopted a definite line of action regarding this matter, but that up to the time of going to press, no notification of what had been decided upon had been received by us for publication. The omission has since been rectified; and we take this, the earliest opportunity, of making acknowledgment. In

the articles in the supplement, it has been mentioned that the subject is one which has been before the Association for some long time. As far back as the annual meeting at Sheffield in 1920, a proposal for the organization of conferences was approved; but railway, coal, and other industrial disturbances led to the scheme being deferred. Now with the present growing demand for greater selling activity, and the possibility of obtaining at lower prices both appliances and plant with which to create and supply increased output, the question comes up again, and it claims vigorous consideration and generous planning.

The General Committee of the Association realize that the problem is essentially a district one; and with this we have previously concurred, and for the same reason as is put forward on behalf of the Association—that salesmen cannot be spared (nor would undertakings generally pay for them) to come regularly to centralized conferences, say, in London. What the Association, therefore, propose is that a Salesman's Conference Organizing Committee should be set-up in each district. It is suggested that each Committee should be composed of the vice-presidents and elected members of the General Committee representing the district, with power to add to their number. Our suggestion was that this work should be placed in the hands of the Commercial Sections of the District Gas Associations; but we have no particular care who are the "top dogs" in organizing the conferences, so long as the work is well done. The Association acknowledge that it would be a great advantage if the co-operation of the Commercial Sections of the districts could be secured, so that the secretaries for the sections could act, in conjunction with the Association's headquarters, as conveners of committee and conferences. Why the "Association headquarters" want to trouble themselves about this matter at all, after inauguration, is not clear. Such conferences surely could be organized, financed, and run locally. Emphatically we say the simpler the machinery the better. Perhaps the reason for "headquarters" having a hand in the matter may be found in two proposals—that from headquarters an appeal should be made to all undertakings in each district to co-operate by affording facilities to as many as possible of the selling and distribution staffs for attending and taking part in the conferences, and that if all members of such staffs could be nominated by their undertakings for election as associate members the subscription (10s. 6d. each per annum) would help pay the organizing expenses. The small expenses that would attach to the conferences, if facilities were afforded by the local undertakings for meeting at their offices, could be easily met by a *pro rata* payment, when the total miscellaneous outgoings were known at the end of a session. One other point. The Association thinks it would be an advantage, from the point of view of co-ordination and interchange of experiences, if the manager could attend both the committee meetings and the conferences, at any rate until the scheme is fully at work. Furthermore, it is suggested that a periodical meeting of the Chairmen of the various District Committees—say, in connection with the quarterly meetings of the General Committee—would also assist to the same ends. We will not discuss these details. They will shape themselves and find their place as matters develop.

Regarding topics for discussion at the conferences, the Association suggest (or rather the General Committee do so) that the questions recently set in the "Bulletin" with the winning answers (which it is proposed to follow up by the setting of one or two questions each month) would provide subjects. We are not much struck with this "ques-" tion-and-winning-answer" method of attempting to interest salesmen. The work of the gas salesman is much too serious and important for men in their position to be treated as schoolchildren, with a prize at the end to incite them to give of, or to do, their best. An outline of questions is also supplied under different headings bearing upon the business relations between a gas undertaking and its customers which might serve as a basis for a series of discussions to be opened by selected speakers having special knowledge and experience. Some half-a-dozen subjects are put forward under the heading "Obtaining Customers;" seven under the heading "Retaining Customers;" and there are four under "Increasing Custom of Existing Consumers."

The scheme adumbrated winds-up with the remark that reports dealing mainly with points of special interest and novelty could be furnished by a local representative for publication in the "Bulletin." We hope, when the scheme reaches maturity, that the meetings will be open ones, so that we can publish reports in "The Gas Salesman." The conferences of electricity salesmen that were held in London last winter were open to the press, and no one suffered in consequence. In fact, information was distributed to electricity salesmen who were unable to be present, and so the conferences were of value to a larger number than that actually present. With district conferences, gas salesmen everywhere will want to learn what is taking place in other districts, and so the largest possible measure of publicity should be given. From the very outset, the conferences should be arranged on a proper basis; and, above all things, let there be an amount of freedom in them, and not too much nursing. If gas salesmen have not sufficient common sense and intelligence to carry on such conferences as they should be conducted, then all we can say is that they are not worthy of being gas salesmen.

Parliamentary.

The House of Lords has adjourned to June 13, and the House of Commons to June 12. Prior to the Whitsuntide recess, Royal Assent was given to the Sheffield Gas Company's Bill, the Stoke-on-Trent Corporation (Gas Consolidation) Bill, and the Blackburn Corporation Bill.

The Auction Clauses.

In the editorial columns of the "JOURNAL" last week, comment was made on what had transpired in connection with the Windsor Gas Company's application for a basic price and basic dividend, as well as on the decision of the Committee not to impose the auction clauses upon the Company. But when the Parliamentary Agent for the Bill (Mr. E. Campbell Cooper) last week brought up clauses to comply with the requirements of the Committee, it was found that the latter were not prepared to give absolute liberty for all time in respect of exemption from the auction clauses. They have insisted on a time limit, thus varying what was done in the Sheffield case. What has been decided in the Windsor case is that there shall be exemption for three years, with power to the Board of Trade to extend the period if thought desirable. But the auction clauses are also to be inserted; so that the Board of Trade will not be compelled to extend the three-years' exemption, unless they are persuaded it should be. Mr. Cooper argued strongly for freedom from the clauses, and for the permanent application of the conditions set out in the stock-issuing clause as he submitted it; but, as will be seen from our report, the Committee were immovable.

Imported Gas Mantles.

The decision of the Referee under the Safeguarding of Industries Act, that the list of dutiable articles should include "mechanical aggregates of oxide of thorium and oxide of cerium, and of nitrate of thorium and nitrate of cerium, being ingredients of incandescent mantles," raises a nice question for the Customs officials, and imposes upon them a beautifully vague basis upon which to levy duty. Really it is one of the most useless decisions that has yet been given. It can do nobody good, and nobody harm, excepting the Customs people themselves, if they attempt to assess the duty payable. The Referee is of opinion that if a gas mantle is liable to duty, even in respect of an ingredient, total exclusion is wrong. Very well. Different types and makes of mantles differ in the amount of thorium and cerium they contain in their structure. Who is to assess the amount? Then a considerable number of mantles can be made from a comparatively small quantity of thorium and cerium. A kilo of thorium will make anything from 700 to 1000 mantles according to size and quality. Therefore, so far as the protection of home gas-mantle manufacture is concerned, the decision has no real value. On the other hand, those who urged that mantles should be duty-free will not find that any duty that can be inflicted under the decision will have any particular effect on them. In short, the decision has shown-up one ridiculous feature of the Act.

Gas Coal Market.

There was a little further easing of prices last week in the Durham and Northumberland districts. For best classes quotations were about 23s. per ton; but there was a marked willingness to take about 22s. There was weakness in the second-class grades; and 20s. f.o.b. was freely taken. There is no doubt the

collieries and the coal dealers are welcoming the larger return by gas undertakings to the purchase of coal by contract; and invitations for tenders are, we hear, receiving a considerable response. In Yorkshire especially, this resumption of contracts is looked upon with favour; and prices from 20s. to 22s. have been agreed upon in various cases. Of Yorkshire brands, the good qualities continue to receive the greater attention. Generally speaking, there is a weakness just now in the markets; and the collieries are eager to book-up positive business with gas-works.

Prof. Armstrong's Old Story.

Time passes. It is long since that Prof. H. E. Armstrong told the gas industry and the world generally that the industry was in a critical state, and that it was going fast on the road to suicide. The gas industry, despite all adverse influences, continues to wax in strength, if material evidence is what is required in proof, and not the mere vapourings of a low-temperature carbonization enthusiast. Of course, Prof. Armstrong, who has a strong belief in his powers of vision, is much behind the times, and appears to have a very fine ability of not seeing even existing facts relating to this question as they are. He told the Manchester and Salford Sanitary Association the other day that he is no advocate of compulsion; but, if action be not soon taken, he would be prepared to join with those who would force the issue. Now we know. We shall await with interest and watch with amusement any quixotic attack that may be made. Meanwhile, we would suggest to Prof. Armstrong not to attach too much importance to the sale of 4000 tons of smokeless fuel, at a higher price than coal. What has to be discovered is whether the masses will pay a higher price for the material than for coal. What a few interested people will do probably is not what the bulk of the people will do.

Nitrate of Soda and Sulphate of Ammonia.

A correspondent of "The Times Trade Supplement" says the strong demand for the principal forms of nitrogen has continued in most countries during the past few weeks. But he asserts that the position with regard to the European stock of nitrate of soda is not, however, quite as favourable as was anticipated; and it is expected that the quantity carried over to next session will run into six figures. The new prices that have been fixed by the Nitrate Producers' Association are, it is thought, hardly calculated to fulfil the expectations of consumers. As to sulphate of ammonia, the writer says it remains to be seen what the sulphate of ammonia producers will do as regards prices for the coming season. Stocks at works are much below normal; and there has been a brisk demand for export up to the end of the year. The outlook leads to the expectation that the producers will fix their prices more nearly on a parity with the price of nitrate of soda than has been the case hitherto. During the past few years, sulphate of ammonia has been comparatively very much cheaper than any other form of nitrogen. From Germany it is reported that attempts are being made to increase the synthetic production; but it is believed this will all be absorbed by the home market, and will not affect export.

The Engineering Lock-Out.

The end of the engineering lock-out is within sight. The event of last week was that the ballot of the forty-seven unions involved (other than the Amalgamated Engineering Union) resulted in forty-five unions accepting the employers' terms. The exceptions were the Boilermakers' Union and the National Union of Foundry Workers. The ballot resulted in 99,313 votes for acceptance, and 46,881 for rejection, or a majority in favour of 52,432. This was conclusive. It was arranged that work should be resumed yesterday by the men of the forty-five unions. As to the Amalgamated Engineering Union, the conference at York last week decided to take a second ballot on the terms; and the President (Mr. Brownlie) strongly advised the members to give the proposals their earnest attention, both on account of the industrial position and the condition of the funds of the Union.

The New Railway Rates for Coal, Iron, and Steel.

The National Federation of Iron and Steel Manufacturers are anything but pleased with the reductions that have been made in railway rates. It is pointed out by the spokesmen for the Federation that unfortunately the way in which the reductions were announced were calculated to give the impression that a great step had been taken towards the resuscitation not only of the iron and steel industry, but of industry generally, and that better times would automatically follow the action of the railway companies. There is regret that such false hopes should have been raised. It is asserted that the effective reductions are so small as to render the practical results almost negligible. In spite of all the efforts made during the past twelve months, employment in the trade is still no more than 50 p.ct. of what it was in the corresponding period of 1920. The number of furnaces in blast, which in 1920 averaged 284, is to-day only 112; and the production of pig iron is only 60 p.ct., and of steel 53 p.ct., of the average rate of production in 1920. The iron and steel industry had hoped that the railway companies would have taken a broad view of the situation, and would have announced reductions which would enable manufacturers to meet foreign competition on more equal terms. It is believed this could have been done without loss to the railway companies; but even if it were not possible, the Federation urge that the railway companies should for a time be prepared to share the losses of industry rather than shelter themselves behind the privileged position they have secured.

PERSONAL.

The St. Helens Town Council, at a meeting last month, confirmed a resolution of the Gas and Lighting Committee dated April 12, that Mr. F. E. WARD, Deputy Gas Engineer, be appointed Engineer and General Manager of the gas-works, as from May 1, 1922, at an inclusive salary of £650 per annum—the appointment to be terminable by three months' notice.

The minutes of the Birkenhead Gas Committee which will be presented to the Town Council to-day report the receipt of a letter from Mr. R. H. BROWN, the Gas Engineer, tendering his resignation, and giving three months' notice as from June 1 to terminate his engagement. The resignation has been accepted by the Committee. Mr. Brown was appointed Gas Engineer in September, 1916, in succession to the late Mr. T. O. Paterson. He entered the Committee's service in 1907, and in 1909 succeeded Mr. H. E. Bloor as Deputy Engineer.

Mr. HENRY WOODALL has been appointed Chairman of the Tottenham District Light, Heat, and Power Company, and Mr. HENRY BAILEY Deputy-Chairman. These appointments have been made in consequence of the death of the Right Hon. Sir Daniel Ford Goddard.

Among the names included in the list of Birthday Honours issued last Saturday, we are pleased to see that of Alderman WILLIAM KAY, who has, in recognition of public services, had conferred upon him the honour of knighthood. Alderman Kay has been twice Lord Mayor of Manchester, and has done much good work for the gas industry, in his position as Chairman of the Corporation Gas Committee. A like honour has been conferred upon Dr. EDWARD JOHN RUSSELL, O.B.E., F.R.S., who is Director of the Rothamsted Experimental Station under the Ministry of Agriculture.

The Home Secretary has appointed Mr. GERALD BELLHOUSE, C.B.E., to the post of Chief Inspector of Factories, rendered vacant by the death of Mr. R. E. Graves, C.B.E. Mr. Bellhouse has been Deputy Chief Inspector since 1917.

Mr. JOSHUA A. DAVY, of Benzole and Bye-Products, Ltd., Crigglestone, near Wakefield, and Mr. MORETON E. MICHLIN, of Wombwell, near Barnsley, have been elected members of the Society of Chemical Industry.

The many friends of Mr. H. M. THORNTON in the gas industry will be interested to learn of the wedding to-day (Wednesday) of his elder daughter, Marjorie Hazel, to Mr. R. Grant Percival, of "Bramerton," Tulse Hill. The marriage took place at St. Margaret's, Westminster, and the Rev. Harold Montague Dale, M.A., B.D., officiated. Many ladies associated with the gas industry have met the bride; and they will be interested to learn that she wore a lace gown with train of silver tissue embroidered with pearls; and her veil was held in place by a coronet of pearls and orange blossom. The bridesmaids, whose dresses were of love-in-the-mist blue georgette with hats of silver lace, were Miss Joyce Thornton (sister of the bride), Miss Ruther, and the Misses Betty and Joan Percival (nieces of the bridegroom). Master John Parsons (nephew of the bridegroom) acted as page. A reception was afterwards given by Mr. and Mrs. Thornton at the Hyde Park Hotel to some 200 guests. Among the many handsome presents received may be mentioned a silver tray from the Managing-Directors of Radiation Ltd., individual gifts from the Directors of the Richmond Gas Stove and Meter Company, and a complete canteen of cutlery and silver in mahogany case on stand from the officials and chief representatives of the Richmond Company.

Estate of the gross value of £3691 was left by the late Mr. A. H. Brookman, Managing Director of the Tenby Gas Consumers' Company. Mr. Francis Barrett, for over twenty years Manager of the Ramsbottom Gas Company, has left £1689.

ELECTRICITY SUPPLY MEMORANDA.

Amendment Proposals.

A CROP of amendments to the Electricity Supply Bill is beginning to grow; and it is clear that the Standing Committee of the House of Commons who will be taking the measure into consideration, with the view to dressing-up and modifying the clauses, will have a considerable amount of work to do. One proposal has reference to districts within the area of a power company that may be considered by the company insufficiently fertile for their cultivation. These Viscount Elveden proposes shall be handed over by Special Order to a joint electricity authority without the consent of the power company. We doubt very much whether the joint authorities will require to be saddled with a lot of small, sparsely populated districts which, being unproductive or frugally contributive of revenue, will be a drawback rather than an assistance. The joint electricity authorities may consider that they are having not a few burdens imposed upon them. Another proposal is a very proper one. It is contemplated that no authorized undertaking shall be shut-down unless a supply can be obtained from some other source at a lower cost than that at which the authorized undertaking can generate, and every undertaking, it is suggested, shall be free to develop so long as it is able to generate at a cost not greater than a supply could be provided by some other source. This, however, is not what the joint authorities desire. There is another amendment in different terms, but with a similar object. But who is to decide whether the local undertaking can generate at a lower price than that at which the joint authority can supply? The duty presumably will fall upon the Electricity Commissioners, who are already withholding sanctions, and in some cases advising supplies from stations not yet in being, and without any reliable evidence as to future costs. The position is a difficult one—for the Electricity Commissioners, as well as for the owners of electricity supply stations. The amendment, if accepted, would be a relief to the latter; but an additional duty of an irksome nature for the former. Their position as judges would not be a happy one; and they would always have to give the authorized suppliers the benefit of any doubt. It is clear, however, that there is a very definite feeling that authorized electricity suppliers should not be made to pay more than local generation would cost them. It would not be fair that they should do so; but how are the joint authorities to justify themselves, or try to do so, except by perhaps inflicting some amount of injustice? Then there is at present a provision in the Bill which includes as a capital charge the payment of interest on the cost of permanent work "whilst the expenditure remains unremunerative." This piece of vagueness, it is to be urged, should be altered to "on the construction of new works during the period of construction, or during the period of five years from the commencement of the financial year next after that in which such expenditure commences to be incurred, whichever shall be the shorter." In a later clause it is provided that "a scheme constituting a joint electricity authority may include provisions authorizing or requiring authorized undertakers, and authorizing companies and other bodies represented on the authority, to contribute towards any administrative expenses of the authority." To this it is desired to add: "Provided that an amount shall be included in any such scheme beyond which no authorized undertaker shall be required to contribute towards any such expenses unless such authorized undertaker is for the time being taking a supply of electricity from the authority." This is a very proper limitation. However, these are samples of proposed amendments. They will not all find acceptance. If they did——perhaps we had better not express a view before the matter is discussed by the Standing Committee.

The Decisions of the Electricity Commissioners.

The Electricity Commissioners do not appear to be giving universal satisfaction in their decisions. It could hardly be expected they would do so. Their position is not one of ease and smoothness; and they are but human, and so liable to err. As to erring, we know what happened at Kingston-on-Thames in regard to permission to make a retrospective increase in price, which the consumers very properly refused to countenance; and Counsel found so much doubt as to whether the retrospective increase was valid, that he advised the Corporation to abandon the idea, which they did. Now the Hammersmith and Ealing Councils seem disposed (so we learn from the "Electrical Times") to put to the test a decision of the Commissioners; in what way is not quite apparent. An agreement was made last year between the two authorities for the supply by the former to the latter of electricity in bulk. The sanction of the Commissioners to the agreement was sought; but it has not been given. Now it is stated that steps are being taken to test the powers of the Commissioners to refuse to authorize the proposal. "Specifications are being prepared, and tenders for cable are now being advertised. As both the town clerks seem confidently to have approved this challenge—probably they even suggested it—here is a pretty case for settlement." In what safe way the two Councils will be able to challenge the decision of the Commissioners we do not know. Section 19 of the Electricity Supply Act of 1919 provides that any two or more of the authorized undertakers within the area of any electricity district may, with the approval of the Commissioners, enter into arrangements for mutual assistance with regard to supply. Therefore, *primâ facie*, it would seem that, if the Commissioners withheld their approval, it would be illegal to proceed. One of the duties of the Commissioners is to co-ordinate the generation and distribution of electricity. Perhaps they have very good reasons for not approving this particular scheme. If they have not done so, it would probably set matters at rest if they would state those reasons. They may be able to see farther into the future than Hammersmith or Ealing; and they may have information as to where, in certain eventualities, Ealing may benefit by taking ant other course. But apparently the position of Ealing is somewhaexigent; and they want to assure the necessary relief in the matter of supply as quickly as possible. Instead of a simple refusal (if this is all they have had), they should surely be enlightened as to what is in the minds of the Commissioners, or be allowed to get on with the job, and leave behind them a situation which is somewhat perplexing. It is obvious that for a period the Commissioners will have some difficulty in making their decisions as to current requirements fit in with their plans for the ultimate concentration of generation. In the case of Grays, for example, the District Council are desirous of obtaining a loan of £5500 from the Electricity Commissioners for the extension of their electricity works—a matter which the Council believe, and so say, is urgent. In declining to give them sanction, the Commissioners suggest that the Council should wait until a supply can be obtained from the Barking station of the County of London Company. How long will that station be before completion? How long before the existing Grays station gets upon it a load beyond its capacity? Can the Council afford to wait?

Interlinking Super-Stations an Excellent Precaution.

Among the proposed amendments to the Electricity Supply Bill is one which proposes that the power given to the Electricity Commissioners in the principal Act to require authorized undertakers to carry into effect arrangements for mutual assistance of the one by the other shall cease to be operative on the coming into action of a scheme for the improvement of the organization for the supply of electricity in any area, whether or not such scheme shall provide for the establishment of a joint electricity authority. We are not altogether persuaded that this is a good thing. It seems that in America even super-stations find it, on occasion, an advantage to be interlinked. Illustration comes from Ontario. Accidents occurred at two generating stations; and the Hydro-Electric Power Commission was suddenly deprived of about 100,000 H.P. Within fifteen minutes, the Canadian Niagara Falls Power Company and the Toronto Power Company were feeding the system of the Commission—part of the deficiency being also supplied by the American plant of the Niagara Falls Power Company. A short circuit on a transmission line was the cause of the trouble, the extent of which finds concrete testimony in the destruction of two 20,000 H.P. generating sets. The flying parts of the generators also effected damage to the roof of a new wing, with the further result that the casings of two other turbines were smashed. Flooding also took place. Super-stations are not immune from disaster. The modern tendency of electrical development is to carry too many eggs in one basket.

A Big Name and Capital for a Little Company.

In the issue of the "JOURNAL" for May 10 [p. 312], we called attention to the fact that the electricity supply industry was beginning to receive attention from company promoters. The case was that of the Chagford and Devon Electric Light Company, with more typographical emphasis on the "Devon" than on the "Chagford." The familiar names of Eaton and Soames were among the Directors—that is to say, familiar to those who followed a few years ago the history of small gas company promotions, with substantial capitals and big expectations. In our reference to the new electrical venture, some particulars were given from the prospectus. Our contemporary, the "Electrical Times" has commented on the document. "Meteor" wants to know more about the tempting and optimistic financial side of this promotion. He cannot from the prospectus find any guarantees that there will be fulfilment of the printed anticipations. With a population of 1500, mostly poor people and cottagers, he calculates that the capital would stand at about £50 per average household; and he asks the pertinent question as to how these poor people are to provide the bare capital charges, let alone the handsome profits that would justify such a glowing prospectus. In "Meteor's" opinion, more information should be published now that the Auditors have resigned. They say that they "have no personal knowledge as to the statements contained in the prospectus, which, owing to the pressure of business, they were unable to verify before its issue to the public."

Halving the Lighting Bill.

We have not the slightest objection to the lighting bills of factories being halved when it is accomplished by bringing the aids provided by science to enable the better utilization of natural light. In "The Times Trade Supplement," a Medical Correspondent has an article in which he shows how it is done. He heads it "Light from Darkness," which is not only a fantastic statement, but is not true. A better heading would have been "From Darkness to Light." He relates how a

textile mill, which was not suitably placed for obtaining in the ordinary way a sufficiency of daylight, decided to adopt a system of prism lighting—substituting prisms for the ordinary glass. These prisms collect light from all angles, and reflect it into the workrooms. It is stated that, since these prism windows have been installed, the concern has been able nearly to halve its lighting bills, to say nothing of the better working conditions, both for safety and increased production. Another firm has put up mirrored reflectors, and has cut down lighting expenses by no less than 60 p.ct. Attention is also drawn to the saving power of white paint. The following percentage reflecting powers of different coloured paints are given—white being taken as 100 p.ct. Light green follows with 53 p.ct.; light yellow, 49 p.ct.; light buff, 44 p.ct.; light grey, 27 p.ct.; brown, 6 p.ct.; red, 5 p.ct. Those who require light as economically as possible are therefore defeating their own desire by using red paint. These are elementary matters in lighting; but they are points that are often overlooked. Good lighting is essential to the highest efficiency of works and men; and as suppliers of a lighting agent, the gas industry has no more objection to the highest efficiency being obtained from daylight than they have from incandescent gas lighting.

The "Rivals." The "Electrician" says the recent debate in the House of Lords on the Electricity Supply Bill brought out a question of principle in regard to legislation for the rival industries—electricity and gas. Lord Newton, our contemporary states, put forward an amendment in the interests of gas companies, which Viscount Peel suavely but summarily disposed of, explaining that it has not been customary to grant gas companies a *locus standi* on Electricity Bills simply on the ground of competition, or to allow them the right to veto electricity supply. Gas companies usually ask for *locus* as ratepayers, and not on the ground of competition. Our contemporary, with charming innocence, suggests that the gas companies, in their view of the present Bill, are evidently more optimistic as to the benefits of electricity supply legislation than a certain section of the electricity supply industry itself. Is it really innocence, or blindness, or a case of attempting to deceive that makes our contemporary write in that way? It is because the gas industry is not optimistic over these schemes that it is desirous that its undertakings shall, as the first or second largest ratepayers in most areas, be protected against having to pay any losses on this grand-scale gamble. In another way our contemporary is ungenerous. It says "*usually* where a gas company supplies gas and electricity, it will be found that no attempt is made to push the use of electricity, and this side of the business is in a chronic state of bankruptcy." This being "usually" the case, we ask our contemporary to give the instances which corroborate its statement, so that inquiry may be made into them. Will it comply with this request?

Power Rates and Intermittent Use. Judgment has been given in an action by the Westminster Electric Supply Corporation for a sum of money which they alleged to be due to them from the Wykeham Studios, Ltd.; and there seems a little inconsistency between the judgment and some of the charge practices of electricity suppliers. The case was heard by Mr. Justice Swift, in the King's Bench Division. The point was as to the rate that should be paid by the defendants for electricity used for photographic purposes. His lordship had no difficulty in deciding that the use was a power one; but this did not dispose of the questions before him. He saw no reason why the plaintiffs should not be allowed to charge the defendants at a higher rate, if the circumstances were not the same, than persons using current for other power purposes. In this case the use was not a regular one, nor for fixed hours of the day or night. It was an intermittent use. His Lordship therefore thought that, although the Company were charging 2d. per unit for current used for other power purposes, they could charge a higher rate to persons who took current for use in a photographic arc lamp. The defendants had had notice of the rates they would be charged, and all photographers in the area were treated in the same way. Judgment was therefore given for the Company for the amount claimed, with costs. The use is a power one; and it is an intermittent use. Therefore a higher rate is charged than to ordinary power users. Cooking, domestic heating, vacuum cleaners, flat irons, electric washing machines, and other things, all constitute intermittent uses; yet some supply undertakers charge the consumption up at ordinary power rates—1½d., 2d., and 2½d. per unit are common ones now.

The summer meeting of the Institution of Mechanical Engineers will comprise a visit to Amiens, Paris, and Liège, from June 12 to 21. The Liège portion of the meeting will be held in conjunction with the International Scientific Congress and Exhibition, organized by l'Association des Ingénieurs sortis de l'Ecole de Liège, to celebrate the seventy-fifth anniversary of their foundation; and it is pointed out that 1922 also marks the seventy-fifth anniversary of the foundation of the Institution of Mechanical Engineers. The Société des Ingénieurs Civils de France have kindly placed their meeting hall and other rooms at the disposal of the Institution for the business portions of the meeting. There are a number of papers to be submitted.

INSTITUTION OF GAS ENGINEERS.

AGENDA FOR THE ANNUAL MEETING.

The following is the agenda which has been prepared for the annual general meeting, to be held on Tuesday, Wednesday, and Thursday, June 20, 21, and 22, at the Institution of Electrical Engineers, Victoria Embankment, under the Presidency of Mr. Thomas Hardie, M.Inst.C.E., Chief Engineer to the Gas Light and Coke Company.

Advance copies of the papers are being prepared for issue to members making application for them.

Tuesday Morning, June 20.

The chair will be taken at 10 a.m.

Minutes of the last annual general meeting to be submitted for confirmation.

Appointment of scrutineers for examination of balloting-lists for election of Officers and Council, members, and associate members.

(1) Address of the President.
(2) Annual report of the Council, and accounts for the year ended Dec. 31, 1921.
(3) Gas Investigation Committee: Statement with reference to the research on Aeration in Atmospheric Burners.
(4) Seventh Report of the Gas Investigation Committee: "Carburetted Water-Gas Plant with Waste-Heat Boiler," with discussion.

(Adjournment at about 1 p.m.)

Tuesday Afternoon, at 3 p.m.

(5) Report of Institution Gas Research Fellowship: "The Liberation of Nitrogen and Sulphur from Coal and Coke as Ammonia," by Dr. A. C. Monkhouse (Institution Gas Research Fellow) and Prof. J. W. Cobb, C.B.E., B.Sc., F.I.C. (Livesey Professor), and discussion.
(6) Report of the Life of Gas-Meters Committee, and discussion.
(7) Report of Refractory Materials Research Committee, to be presented by Mr. A. E. Broadberry, M.Inst.C.E., Chairman of the Committee: (*a*) "The Thermal Conductivity of Refractories at High Temperatures," by Mr. A. T. Green. (*b*) "The Standardization of the After-Contraction Test," by Miss D. A. Jones, B.Sc., and discussion.

Wednesday Morning, June 21.

The chair will be taken at 10 a.m.

Annual General Meeting of the Benevolent Fund.

Minutes of the last annual general meeting to be submitted for confirmation.

Annual report of the Committee of Management for year 1921 22, and accounts for year ended Dec. 31, 1921.

Announcement of election of two members of Committee of Management to succeed those retiring in order of rotation.

Other business.

Institution Meeting.

After the meeting of the Benevolent Fund, the meeting of the Institution will be resumed.

(8) Paper on "Some Gas-Burners and a Moral," by Dr. Charles Carpenter, C.B.E., M.Inst.C.E., and discussion.
(9) Paper on "Increasing the Rate of Carbonization of Coal," by Dr. Geoffrey Weyman, of Newcastle-on-Tyne, and discussion.

(Adjournment at about 1 p.m.)

Wednesday Afternoon, at 3 p.m.

(10) Paper on "Reconstruction Work at Beckton," by Mr. W. B. Leech, and discussion.

Thursday Morning, June 22.

The chair will be taken at 10 a.m.

Welcome to the Société Technique de l'Industrie du Gaz en France.

Reply by the President, M. Robert Ellissen.

(11) Paper on "A Recording and Integrating Gas Calorimeter," by Prof. C. V. Boys, F.R.S., and discussion.

Election of honorary members.
Scrutineers' report.
Place of meeting next year.
Votes of thanks.

Thursday Evening.

The President and Mrs. Hardie's reception and dance will take place in the evening at the Royal Institute of Painters in Water Colours, Piccadilly. Exhibition of pictures by the Modern Society of Portrait Painters. Galleries open at 7.30. Reception commences at 8 p.m.

Friday, June 23.

For those members who have accepted the invitation of the Governor (Mr. D. Milne Watson) and Court of Directors of the

Gas Light and Coke Company to visit their Beckton works, the following arrangements have been made.

Tickets to be obtained from the Secretary of the Institution not later than June 14.

9.30 a.m. Special steamer leaves Westminster Pier.
11.0 a.m. Arrive Beckton. Inspection of works.
1.30 p.m. Luncheon.

In the afternoon opportunity will be given for further inspection of the works.

3.30, 4.30, and 5 p.m. Motor coaches leave Beckton for return to Westminster.

ANNUAL REPORT OF THE COUNCIL.

The Council of the Institution of Gas Engineers have issued to the members their report on the present position of the Institution and the work during the presidential year 1921-22.

Membership.

At the end of the year 1921, the total membership was 954, as compared with 904 at the close of the previous year.

Transfers and Students.

The Council have transferred the following from the class of associate member to that of member: Henry L. Bateman, Wakefield; Thomas S. Godwin, Watford; John T. Joyce, Weymouth; Henry H. Kinneir, Swindon; and Ernest Scears, Redhill. They have admitted the following as students: Lawrence W. Boulter, London; Oswald P. Cronshaw, Accrington; Harold Jack, Southport; James F. Levisohn, B.Sc., Leeds; John A. Rose, Wapping; Ernest Sainsbury, Birmingham; Eric B. Shaw, Stoke-on-Trent; William J. Shelley, Walsall; William J. R. Waterfield, Brentford; and William H. Watkins, Sydenham.

Deaths.

The deaths of the following members have to be recorded with deep regret: John Ballantyne, Hamilton; Francis Barrett, Stubbins; A. H. Brookman, Tenby; William Robert Cooper, Banbury; Thomas Duxbury, Manchester; Albert Ellissen, Paris; Ernest Frith, Frodsham; The Rt. Hon. Sir Daniel Ford Goddard, Ipswich; Charles Hastings, London; T. S. Lacey, London; Prosper de Lachomette, Lyons; W. R. Phillips, Luton; William Thomson (Ramsgate); John C. Viggars (student), Wrexham; John West, Southport; and Thomas Wilson, late of Coatbridge. Of these, M. Ellissen, M. de Lachomette, Mr. Duxbury, and Mr. West were honorary members. Mr. West was awarded the Birmingham Medal of the Institution in 1918.

National Gas Council.

The four representatives of the Institution on the Central Executive Board of the National Gas Council for the year have been: Mr. Thomas Goulden, Mr. Thomas Hardie, Mr. J. D. Smith, and Mr. Samuel Tagg.

Affiliated District Associations.

The District Associations affiliated with the Institution have been represented on the Council during the year as follows:

Eastern Counties Association . .	Mr. A. W. Sumner.
Manchester District Institution . .	Mr. E. H. Hudson.
Midland Association	Mr. J. R. Duff.
North British Association	Mr. J. Dickson.
North of England Association . .	Mr. F. C. Willis.
Southern Association	Mr. J. W. Whimster.
Wales and Monmouthshire Institution	Mr. J. H. Canning, O.B.E.

Annual General Meeting.

Arrangements were made for holding the annual general meeting of 1921 from the 24th to 26th of May; and the programme was to have included a visit of members of the Société Technique de l'Industrie du Gaz en France, many of whom the Institution were hoping to have the pleasure of welcoming. Owing, however, to the unfortunate continuance of the coal dispute, it was found necessary to postpone the meeting and visit. The postponed meeting took place at the Central Hall, Westminster, on Tuesday and Wednesday, Oct. 11 and 12, 1921, under the presidency of Mr. Thomas Goulden, M.Inst.C.E., Chief Engineer to the Gas Light and Coke Company. On Thursday, Oct. 13, the East Greenwich Works of the South Metropolitan Gas Company were visited, by invitation of the President of the Company (Dr. Charles Carpenter) and Directors, during which the members were hospitably entertained. H.M. Fuel Research Station adjoining was also visited, by invitation of the Director of the Fuel Research Board, Sir George Beilby.

Gas Investigation Committee.

No change has taken place in the constitution of this Committee during the year; and the Joint Committee on Gas Heating, Lighting, and Ventilation Research, of the Institution of Gas Engineers and the University of Leeds, have continued to act as Research Sub-Committee. The staff engaged upon research work has also remained unchanged.

During the past twelve months, research work has been carried out in two sections under the supervision of Prof. Cobb. The first section of the work consists of an investigation into the injector action as occurring in atmospheric burners. This marks a return to the study of the behaviour in use of different grades of gas, which had to be suspended for twelve months in order to allow of the investigation on Recording Gas Calorimeters, the results of which were embodied in the Fifth Report last year. The work bears upon questions which will become more urgent if the grades of gas are varied more widely, and requires that a large number of experiments should be made on gas mixtures of known density and composition under carefully ascertained conditions. Mr. James W. Wood (Research Chemist) has been engaged upon this problem, assisted by Mr. G. B. Howarth. The second part of the work has been the study of a carburetted water-gas plant with an attached waste-heat boiler. The results obtained will supplement usefully, it is believed, those reported last year for a blue water-gas plant. This work has been in the immediate charge of Dr. A. Parker, assisted by Mr. H. Kerr and Mr. F. S. Townend. The actual control of the carburetted water-gas plant was in the hands of Mr. G. C. Pearson, of the Birmingham Corporation Gas Department.

The Committee would like to acknowledge the skill and zeal which have been displayed by the members of their staff. The facilities required for both branches of investigation were once more afforded by the Birmingham Corporation Gas Department; and the Committee take this opportunity of expressing their thanks to the department, as also to the staff, for the help they have rendered.

Institution Gas Research Fellowship.

Work has been continued during the year by Dr. A. C. Monkhouse, who was re-elected to the Fellowship. The results obtained will be reported at the forthcoming meeting of the Institution, in the form of a joint paper by Dr. Monkhouse and Prof. Cobb, entitled "The Liberation of Nitrogen and Sulphur from Coal and Coke," which will deal mainly with the influence of different atmospheres and temperatures on the formation of such constituents as ammonia and sulphuretted hydrogen.

Corbet Woodall Scholarship.

This scholarship became vacant by the graduation and appointment of the holder, Mr. L. P. Ingram, to the post of Assistant Engineer and Chemist to the Plymouth Gas Company. No re-election to the scholarship was made last June (1921), because no candidate judged to be suitable offered himself; but it was to be advertised again in May, 1922, and it is hoped that an election will follow.

Livesey Memorial Professorship.

The activities of the Department of Coal Gas and Fuel Industries in the University of Leeds, over which the Livesey Professor presides, have been extended during the year by the formation of a Joint Benzole Research Committee between the University and the National Benzole Association. The formation of this Committee was the result of an invitation from the National Benzole Association to the University, which stated that, in the opinion of the Association, research in the benzole industry would benefit from the formation of a Joint Committee with the University, to be constituted and to work on the same lines as the existing Joint Gas Research Committee. The University were very pleased to collaborate in this matter; and the Joint Benzole Research Committee have been formed, with Mr. Samuel Henshaw, F.I.C., as Chairman. Members have been nominated by the National Benzole Association and the University. A Research Chemist, Mr. E. C. Williams, M.Sc., has been appointed, and started work in November last.

Research work has been carried out on fuel; and most of the results have been reported to the Institution. Investigations have also been carried out on the subject of refractory materials, mainly on silica, by a Research Assistant, Mr. H. S. Houldsworth, appointed for the purpose.

The number of students in training is at present placing a strain on the accommodation of the Department; but some further accommodation has been provided by the courtesy of the Mining Department. Another mechanic has been appointed; and a new workshop is to be erected. The building for the housing of the new experimental gas plant, which Mr. Henry Woodall is providing, is now in course of erection.

British Refractories Research Association.

Mr. A. E. Broadberry and Mr. W. E. Price have continued as the representatives of the Institution on the Council of the British Refractories Research Association. They report that the prospects of the Association have improved, and that financial arrangements have been made which will enable the research work to be satisfactorily and efficiently carried out.

Refractories Materials Joint Research Committee.

During the year the Committee (composed of representatives of the Institution and the Society of British Gas Industries) have been engaged on the revision of the Standard Specification, with a view to the publication of a new edition as soon as possible.

By arrangement with the British Refractories Research Association, the following communications will be presented at the forthcoming meeting of the Institution: (*a*) "Thermal Conductivity of Refractory Materials," by Mr. A. T. Green; (*b*) "Observations of the After-Contraction Test," by Miss D. A. Jones.

Life of Gas-Meters Joint Committee.

This Committee (consisting of representatives of the Institution and the Society of British Gas Industries) have been engaged on the following subjects during the course of the year: Absorption of hydrocyanic acid; corrosion of mains, services, &c.; new

standard list of dry gas-meters; maintenance of prepayment meters; and leakages at meter stuffing-boxes. The report of the Committee will be presented at the forthcoming meeting of the Institution.

GAS COKE FOR STEAM RAISING.

Consideration has been given to the suggestion that tests of gas coke for steam raising should be carried out, and correspondence on the subject is now proceeding with the London Coke Committee.

CARBON MONOXIDE.

The question of carbon monoxide is continuing to receive the attention of the Council.

SHIPPING, ENGINEERING, AND MACHINERY EXHIBITION.

On the invitation of the General Manager (Mr. F. W. Bridges), the Institution visited this Exhibition at Olympia on Sept. 23, 1921.

PUBLIC WORKS, ROADS, AND TRANSPORT CONGRESS AND EXHIBITION.

At the request of the Organizing Committee, the Institution undertook to provide the programme of papers for the opening day of this Congress (Nov. 18, 1921), held at the Agricultural Hall, London. The President, Mr. T. Hardie, occupied the chair.

NATIONAL ILLUMINATION COMMITTEE OF GREAT BRITAIN (AFFILIATED TO THE INTERNATIONAL COMMISSION ON ILLUMINATION).

The report of the Chairman for the year 1921—Major Kenelm Edgcumbe, R.E. (T.)—is as follows:

The most important event during the year was the plenary meeting of the International Commission on Illumination, held in Paris from the 5th to the 8th of July last. Dr. Coleman, who, with Mr. Gaster, has been the representative of the British National Committee on the Commission since 1914, being unable to attend, Major K. Edgcumbe was appointed to take his place. The members of the British Committee who attended the Paris meeting were: Major K. Edgcumbe, Mr. L. Gaster, Mr. C. C. Paterson, Dr. E. H. Rayner, Mr. A. P. Trotter, Mr. J. W. T. Walsh, and Mr. R. Watson. Mr. Percy Good was, at the last minute, prevented from attending. A most excellent report of the proceedings was prepared by Mr. R. Watson in the form of a paper presented to the Institution of Gas Engineers.

The principal features of the International Meeting may be briefly summarized as follows:

1.—The adoption, on the recommendation of the British Committee, of the "International Candle" as defined by the Standardizing Laboratories of Great Britain, France, and the United States of America.

2.—The following terms, as well as their units, were defined: Luminous flux, illumination, and luminous intensity. The definitions adopted closely followed those proposed some years previously by M. Blondel; and though the British delegates were in disagreement with the latter on several points—notably in treating "luminous flux" as a rate of flow, instead of as an entity—it soon became evident to them that international agreement was only possible by the adoption of such conventions which, though admittedly ambiguous, had already come into somewhat extensive use.

3.—Discussions took place on various subjects, notably upon heterochromatic and physical photometry, the lighting of factories, schools, &c., and the avoidance of glare in automobile headlights.

4.—Committees were appointed to deal with the following subjects, the representatives of Great Britain upon each being shown in brackets: Heterochromatic Photometry (Dr. E. H. Rayner); Definitions and Symbols (Mr. J. W. T. Walsh); Lighting of Factories and Schools (Mr. L. Gaster); Automobile Lighting (to be nominated by the British National Committee).

5.—It was decided to base the annual contribution to be made by each country upon its population, instead of making it a fixed sum, as heretofore. The total income budgeted for was £600 per annum, of which the share of Great Britain, upon the above basis, is £113 10s.

6.—The following officers were appointed: President: Dr. E. P. Hyde (U.S.A.). Vice-Presidents: M. F. Roland (France), M. G. Semenza (Italy), Major K. Edgcumbe (Great Britain). Hon. Secretary: Mr. C. C. Paterson (Great Britain). Assistant Secretary: Mr. J. W. T. Walsh (Great Britain). M. Th. Vautier, the retiring President, was unanimously elected an Hon. President, in recognition of his long and devoted work in connection with the Commission.

7.—It was decided to hold the next meeting in 1924; New York being provisionally selected as the meeting-place.

In view of the decisions come to at the Paris meeting, it was necessary for the definitions provisionally drawn-up by the British Committee to be somewhat modified. This was undertaken by the Nomenclature Sub-Committee; and after approval by the British National Committee, the revised draft was circulated to the three constituent societies, with the request that, in the event of any disagreement, they would communicate with the Hon. Secretary. No objections have been received; and the Institution of Electrical Engineers have already published the definitions in their journal. A list of the definitions, as approved, form an appendix to the present report.

During the year there have been seven meetings of the National Illumination Committee, as well as a large number of meetings of the Nomenclature Sub-Committee. All these have been held at the offices of the Illuminating Engineering Society; and the best thanks of the Committee are due to the Society, as well as to Mr. L. Gaster (the Hon. Secretary), for their kindness in this respect.

APPENDIX TO REPORT OF NATIONAL ILLUMINATION COMMITTEE.

Definitions and Units.

(1) Luminous flux is the rate of passage of radiant energy evaluated according to the luminous sensation produced by it. Since for all practical photometric purposes the velocity of light may be regarded as constant, luminous flux may be treated as an entity, and is so treated in the definitions which follow.

(2) The unit of luminous flux is the lumen. It is equal to the luminous flux emitted per unit solid angle by a uniform point source of one international candle.

(3) A luminous source is one which emits luminous flux. A point source is one which subtends a negligibly small angle at the point from which it is observed.

(4) The luminous intensity or candle power of a point source in any direction is the luminous flux emitted in that direction by the source per unit solid angle.

(5) The unit of luminous intensity or candle power is the international candle. This unit is the outcome of agreement arrived at by the three National Standardizing Laboratories of France, Great Britain, and the United States of America in 1909. The unit has since that time been preserved by these laboratories by means of electric incandescent lamps; and the laboratories are still responsible for its preservation.

(6) The average candle power of a luminous source is the average value of the candle power in all directions. [This term is recommended in place of the term "mean spherical candle power."] When it is desired to define the average value of the candle power in a given zone or given hemisphere, this should be specified thus: "Average candle power (upper hemisphere)."

(7) The illumination at a surface is the luminous flux reaching that surface per unit area.

(8) The practical unit of illumination is the lux. It is the illumination at the surface of a sphere of one metre radius, due to a uniform point source of one candle placed at its centre—*i.e.*, it is equal to one lumen per square metre.

If the centimetre be taken as the unit of length, the unit of illumination is the lumen per square centimetre, known as the phot. If the foot is taken as the unit of length, the unit of illumination is the lumen per square foot, known as the foot-candle.

1 foot-candle = 10·764 lux = 1·0764 milli-phot.

(9) The brightness of a surface in a given direction is the candle power per unit projected area of the surface in that direction. It is expressed either in candles per square millimetre or per square metre.

(10) The specific output of an electric lamp is the ratio of the luminous flux to the power input. It is expressed in lumens per watt. The specific output of a source depending on combustion is similarly expressed in lumens per British thermal unit per hour.

(11) The specific consumption of an electric lamp is the ratio of the power input to the average candle power. It is expressed in watts per average candle. The specific consumption of a source depending on combustion is similarly expressed in British thermal units per hour per average candle.

(12) The reflection ratio of a surface for radiant energy of given spectral distribution is the ratio of the luminous flux leaving the surface to the luminous flux incident thereat; both being expressed in lumens. [This quantity has hitherto been termed the "co-efficient of reflection."]

(13) The absorption ratio of a body for radiant energy of given spectral distribution is the ratio of the luminous flux absorbed by the body to the luminous flux incident thereat, both being expressed in lumens.

(14) The transmission ratio of a body for radiant energy of given spectral distribution is the ratio of the luminous flux passing through the body to the luminous flux incident thereat, both being expressed in lumens.

BRITISH ASSOCIATION FUEL ECONOMY COMMITTEE.

Mr. D. H. Helps, the Institution's representative on this Committee, writes:

Since my last report, the following new members have accepted an invitation to serve on the Committee: Mr. J. E. Hackford (on the nomination of the Institution of Petroleum Technologists), Mr. H. Stafford Rayner (on the nomination of the Federation of British Industries), Mr. W. C. P. Tapper and Mr. L. L. Robinson (co-opted on to Power Sub-Section).

The re-appointment of the Fuel Economy Committee, with the ordinary position and power of research committees of the Association, was confirmed at a meeting of the Council of the British Association in December last (1921). In the Committee's fourth report [see "GAS JOURNAL," Sept. 21, 1921, p. 656], they expressed the view that limitations as to the amount of (*a*) carbon monoxide and (*b*) incombustible constituents in public gas supplies were desirable. Messrs. E. V. Evans, H. James Yates, and I dissented from this view; being of opinion that, in view of the provisions of the Gas Regulation Act, 1920, for the future sale of gas on a thermal basis, gas undertakings should be allowed a free hand in regard to carbon monoxide and inerts.

The Committee's fifth report is now in course of preparation; and they are engaged in considering the following subjects: (1) The results of recent work on the chemical constitution of coal. (2) Oil fuel. (3) Recent work upon the efficiencies of domestic cooking and heating appliances, together with the results of Dr. Margaret Fishenden's determination of the efficiencies of open fire-places, and of figures relative to the efficiencies of gas-fires. (4) The thermal efficiencies now obtained or obtainable in the generation of electricity from coal in large power stations, and data *re* fuel consumption in steam-raising in factories and other industrial plants.

With regard to item 3, at a Committee meeting which I attended, on April 5, 1922, I urged that if any particulars are given with respect to the relative efficiencies of electrical and gas apparatus for domestic cooking and heating details should also be included with respect to the thermal efficiencies in the production of electricity and town gas. At the meeting referred to above, Prof. Bone presented a printed report by Alice Hamilton, M.D., on "Carbon Monoxide Poisoning," Bulletin No. 291, issued by the United States Bureau of Labour Statistics.

The question of low-temperature carbonization has been discussed

on several occasions; but nothing definite has been done in the matter.

EDUCATION OF GAS ENGINEERS.

A draft scheme has now been agreed between the Committee of the Institution and the representatives of the Board of Education, which will be submitted to the Council for consideration.

LIBRARY.

The donations to the Library which have been received during the year are enumerated in an appendix circulated with the report. The Council desire to express their appreciation of these gifts, and would remind members that works of interest to gas engineers are always welcome.

ACCOUNTS.

The accounts for the year ended Dec. 31, 1921, duly certified by the Auditors (Mr. S. Y. Shoubridge and Messrs. Wood, Drew, & Co.), are appended to the report.

T. HARDIE, *President.*
W. T. DUNN, *Secretary.*

June 2, 1922.

The Benevolent Fund.

The Committee of Management have pleasure in reporting that the income of the fund for the year ended Dec. 31, 1921, has been maintained. They have gratefully to acknowledge the gift of £100 received from Mr. F. J. North, in memory of his father, the late Mr. William North. With reference to the value of the investments which have previously been shown at cost-price, these have now been written-down to market value.

During the year under review, the Committee have granted assistance in eleven cases, after satisfactory reports had been received from members of the Institution who have kindly acted as visitors.

The Committee wish to point out that the number of subscribers to the fund totals 358, while the membership of the Institution is 954. To those whose names are not already on the list of subscribers, they would earnestly appeal for help to maintain the good work which is being accomplished by means of the fund in rendering financial assistance to those associated with the Institution who are in distressed circumstances. In most of the cases the amounts of the grants have been increased during the year, and consequently a larger income will be required.

Mr. W. Rogerson having been elected Hon. Secretary of the Manchester District Institution of Gas Engineers, in succession to Mr. G. S. Frith, becomes in that capacity a member of the Committee of Management.

The two members of the Committee retiring in order of rotation, after having completed three years of service in accordance with the rules, are Mr. Samuel Glover, of St. Helens, and Mr. John Terrace, of Lower Sydenham. To serve in their places the Committee have nominated for election at the forthcoming annual meeting Mr. R. E. Gibson, of Liverpool, and Mr. E. G. Hutchinson, of Richmond, Surrey.

Heat-Unit Basis in America.

In a paper read at the Southern Gas Association Convention, Mr. Edward L. Rieha, of Baltimore, remarked that, as a number of recent decisions by the Federal Courts in different parts of the country are evincing a marked conciliatory attitude in regard to public utility valuations and rates of return on investment, there is at least hope for the gas industry that, likewise, soon the State regulatory bodies will learn the necessity of permitting the gas companies to select within fairly wide limits that calorific standard which lends itself to the most economical utilization of the raw materials available, and renders the consumer the best possible service. Here will be the dawn of a better day. The freedom to develop on economic lines is something that contains enormous potentiality. It brings fresh scope to active research and invention for the provision of plant which will enlarge the production of saleable B.Th.U. per ton of coal treated, and for the devising of appliances which will increase efficiency in the use of the heat energy supplied and paid for. If two B.Th.U. can be produced where only one was produced before, and this by some reduction of the heat hitherto expended in the work, and if one B.Th.U. can be got to do nearly the same amount of usefulness as two B.Th.U. did before, the aggregate increase in efficiency of the gas industry will be of a stupendous order, and the raw material saved of pronounced national importance. It has proved extremely difficult to set down definite figures for the calorific value of a lower B.Th.U. gas which could be applied universally. Existing plant conditions and locality have an important bearing on the subject. The discussion, which has arisen principally relative to the minimum heating value limits per cubic foot of gas has brought forth a wide diversity of opinion, and rightly so. Yet no one will deny the fact that such high B.Th.U. standards as have been prevailing—and especially in some sections of the South—are totally wrong and unfair, not only to the gas company, but likewise, if not more so, to the consumers. It was with the purpose of rectifying this error, and securing some publicity on the subject, that the Committee on Calorific Standards of the Southern Gas Association recommended with considerable emphasis a gas heating value ranging from 425 to 525 B.Th.U.—whichever was best suited for the respective gas company and the community they served.

THE STRUCTURE OF COKE: ITS ORIGIN AND DEVELOPMENT.

By Sir GEORGE BEILBY, Director of the Fuel Research Board.

[A Paper read before the London Section of the Society of Chemical Industry, May 29.]

In connection with the work of the Fuel Research Board, it was early recognized that, for the study of the behaviour of different types of coal during carbonization, the ordinary laboratory methods of coal testing and analysis were quite inadequate, and that for the purposes of this inquiry a new method of assay must be elaborated. A full description of the method which was ultimately devised, and of the apparatus in which it is carried out, has already been published.* In this apparatus, the yields of the principal products of carbonization at any given temperature are ascertained by direct weighing and measurement; while much useful information is obtained as to the physical and other properties of the products. Of no less importance are the opportunities which this method presents for the study of the behaviour of different types of coal during carbonization—*e.g.*, the stages in the evolution of the hydrocarbon gases, the changes in composition of these at each stage, and the influence of the fusibility of the coal on the ultimate form and structure of the resulting coke. The latter study has a very direct bearing on the practical side of the problem of industrial carbonization, not only for the production of a satisfactory smokeless fuel for domestic use, but also on the production of coke for metallurgical and other industrial purposes.

In dealing with the following experimental observations, it must be borne in mind that for the most part they were carried out on average samples taken from bulk deliveries of the different coals as they were received at H.M. Fuel Research Station. The deliveries in some cases represented the whole coal from one definite seam, and in other cases the result of screening, or screening and washing, the small coal from several seams. No attempt was made at this stage to carry out the separate examination of the district bands of which the seams were composed.

The samples used were obtained by methods which have been described in the reports of the station; but for the present purpose it is sufficient to note that a large bulk sample was crushed, mixed, quartered, and finally ground till it would all pass through a 50-mesh sieve. The material carbonized in the assay apparatus in the laboratory, and later in the trays of the horizontal retorts, may therefore be regarded as a homogeneous mixture, the behaviour of which on carbonization, and the products obtained therefrom, accurately represent the characteristics of the coal as a whole.

Most seams are built-up of bands of varying fusibility, each of which would give different results if carbonized by itself. When coal in the rough is carbonized in gas-retorts, it is often possible to pick-out pieces of the coke which have obviously resulted from bands of different fusibility. When the more fusible parts preponderate, the fusion may become so general as to absorb the less fusible portions into one indistinguishable mass. In other cases the infusible portions retain their individuality, but are concreted by the fused material into a caked mass. The latter effect is very noticeable when a caking or partially caking coal is carbonized in continuous vertical retorts; while in heavily charged horizontal retorts, in which the charge is undisturbed from start to finish, the effects of general interfusion are more in evidence.

The results of carbonization in the laboratory assay apparatus throw a great deal of light on the behaviour of coals of different fusibility in a fine state of division and in homogeneous mixtures. Coals for the purposes of carbonization may be classed under two heads:

(*a*) Those in which the resulting coke occupies a greater volume than the original coal.
(*b*) Those in which it occupies a smaller volume.

The behaviour of class (*a*) is often referred to as due to the "expansion" of the coal. This might be taken as implying that the actual coke substance, the material of which the coke structure is built-up, may be less dense than the coal substance from which it is produced. This it never is, for the coke substance essentially consists of carbon in the vitreous state which in itself is structureless, and the density of which is in the neighbourhood of 1·8.

THE FORMATION OF CARBON.

Microscopic study which began with the examination of specimens of coke resulting from the laboratory assay of individual coals of different degrees of fusibility, and of mixtures of these, naturally led to a more extended inquiry into the origin of coke structure, and as to the means by which it can be modified and controlled.

In charcoal and coke, carbon appears as the non-volatile residue of destructive distillation or carbonization. It results from the decomposition by heat of the complex organic substances of which wood, peat, lignite, and coal are composed, and the driving-off by heat of the volatile products of this decomposition. The

* Fuel Research Board Technical Paper No. 1: "The Assay of Coal for Carbonization Purposes," by Thomas Gray, D.Sc., Ph.D., and J. G. King, F.I.C.

higher the temperature of carbonization, the more complete are the decomposition and volatilization, and the smaller, therefore, are the percentages of hydrogen and other gaseous elements left in combination with the residual carbon. By carbonization at 1100° to 1200° C., the volatile matter left in the residue may be reduced to less than 1 p.ct.

The non-volatile constituents of the original material are concentrated in the carbon residue, and may exercise a considerable influence on its structure. In the case of coke this influence will be traced with some detail in what follows; but it has a special significance in the case of wood charcoal which may be referred to now. Even a superficial observation of the charcoal from various kinds of wood shows that the general features of the wood structure are preserved in the charcoal. The microscope not only confirms this general likeness, but shows the persistence of the actual cell structure. Prof. Farmer tells me that anyone familiar with the micro-structure of various kinds of wood can without difficulty identify the particular wood from which a specimen of finely-powdered charcoal has been prepared. It is, perhaps, not so generally known that this identification of cell structure can to some extent be followed to an even later stage by the study of the ash left on the combustion of wood charcoal. A piece of wood charcoal, if allowed to burn quietly away in the absence of draughts, leaves its mineral ash in the form of a delicate lace-like skeleton in which the minute cellular structure of the wood is reproduced. This suggests that these mineral constituents may actually contribute to the preservation of the plant cell structure in the charcoal, by providing infusible nuclei distributed through the cell walls, thereby minimizing the obscuring effects of the fusion of the carbon compounds during carbonization. For we must now recognize that the production of an infusible carbonaceous residue from organic materials is invariably preceded by the fusion of the compounds of carbon with hydrogen and oxygen (and sometimes sulphur and nitrogen) which results from the decomposition of these materials by heat. For each type of organic substance there is a stage in carbon concentration at which fusibility ceases. In some cases the range of fusibility is extended by raising the temperature of carbonization. This, as will be seen, is the case in coal and similar bituminous materials; while in carbohydrates like sugar and cellulose, the carbon concentration with the resulting infusibility is definitely reached at a much lower temperature, and no fresh access of fusibility can be induced by the application of higher temperatures.

In sugar we are fortunately provided with a pure chemical substance from which a carbonaceous residue can be prepared which is practically free from mineral and other impurities. This residue only contains minute quantities of hydrogen and oxygen; and it approaches more nearly to elementary purity than any form of carbon other than diamond and graphite. Indeed, it is by no means certain that graphite is really carbon in the elementary state, as Sir William Bragg's work on the atomic structure of diamond and graphite indicates that, in the relatively open packing of graphite, there is room for a layer of hydrogen atoms between the more densely packed lamellæ which are in diamond formation. It may be, therefore, that graphite is not pure carbon, but a definite compound of carbon and hydrogen.

It has hitherto been the custom to refer to all forms of carbon other than diamond and graphite as amorphous. In his work on "The Electric Furnace," Henri Moissan devotes a chapter to his study of amorphous carbon, in the opening paragraphs of which the following sentences occur:

> Carbon is the element which presents the most interesting allotropic varieties. It has long attracted the notice of workers by its contradictory properties and by the differences existing between the specific heats of the diamond, of graphite, and of lampblack. . . .
>
> Theses have often been written on the hypothetical shape of the carbon atom; but there are relatively few experiments on the physical and chemical properties of the same carbon. . . .
>
> In order to reproduce the diamond, we were led to take up again a general study of the different varieties of carbon. . . . In the first part we shall deal with the amorphous kinds of carbon. . .

While Moissan made full use of the microscope in the study of graphite and diamond, his references to the micro-structure of amorphous carbon are very casual, and amount to little more than the statement that the substance was "amorphous," which generally appears to mean that it was in the form of a brown or black impalpable powder. For the purpose of his experimental work on the artificial production of diamond, the study of amorphous carbon was mainly directed to its response to oxidation by oxygen and by chemical agents, and its differentiation by these tests from graphite and diamond. His study of lampblack led him to the conclusion that the carbon in this substance can be polymerized by calcination. The temperature of combustion of purified lampblack in oxygen was found to be 371° C. This lampblack was calcined for five minutes in a porcelain crucible at 910° C., and its temperature of combustion rose to 440° C. After calcination for three hours, the temperature of combustion rose to 476° C., and after six hours to 506° C. The density was raised by calcination to 1·87. No attempt was made to associate the increase of density and the reduction of reactivity with the change in the state of aggregation which should have been plainly seen in the micro-structure. It appears to me that these changes may quite well be accounted for by changes in molecular aggregation.

The more careful study of the aggregation of solids which had already begun some years before the publication of Moissan's work, had shown that the blessed word "amorphous" was too apt to be used to cover our ignorance of forms of aggregation in which the atoms and molecules are not in the orderly formation and equilibrium which is the essential feature of the crystalline state.

The vitreous state to which we owe so much in our daily lives, where it is presented to us at every turn, not only in its more obvious forms as glass and porcelain, but equally in metals and alloys in the hardened state, is no longer regarded as outside the scope of physics, chemistry, and metallurgy. It is a definite form of molecular aggregation which over a long range of temperature is thermally as permanent as the crystalline state; while in many cases it is physically the more stable form. We now know that the special rigidity of the vitreous state is always associated with a state of strain which impairs the elastic freedom of the individual molecules. The remarkable hardness of vitreous carbon is associated with the type of brittleness which results from this state of strain.

It is in virtue of that state of internal strain that glass can be cut by the diamond. The diamond does not really "cut" glass; it cleaves it. The cleft which can be initiated by the pressure of the diamond at the surface, owing to the state of elastic strain of the glass, spreads indefinitely in the plane in which it is initiated, owing to the state of elastic strain of the glass. In the crystalline state, this elastic strain does not exist. A single well-developed crystal can be cleft along certain definite planes; but the cleavage in this case is due to the homogeneous aggregation of molecules in definite lamellæ between which either cleavage or slip may occur.

Carbonization of Sugar.

My own study of the steps in the formation of carbon by the carbonization of sugar, and of the micro-structure and properties of this substance, have led to the conclusion that in most, if not all, of the carbonaceous residues with which we are familiar, from wood charcoal to hard coke, the carbon is in the vitreous state—it is a true glass. This glass-like character of the ultimate coke substance has from time to time been referred to by various observers, though its significance from the physical point of view, and its influence on the structure and properties of coke, have not, so far as I am aware, been hitherto recognized.

The first experiment on the carbonization of sugar was made by slowly heating a small crystal which weighed a few milligrammes on a glass micro-slip on a hot plate heated by a ring burner. Fusion without discolorization took place at 180° to 190° C. Evolution of gas, mainly water vapour, with bubbling and foaming, began at 200°. This practically ceased about 240° to 250°, and the slightly brown viscous liquid became tranquil, and remained so till about 260° to 270°, when gas was again evolved with vigorous bubbling and frothing, and the colour of the residue became black, except in films or layers of extreme thinness. The temperature was gradually raised to about 450°. This vitreous carbon is entirely without metallic reflection. Its surface is as smooth as glass, and does not scatter light, even under concentrated illumination.

Mr. King, Chief of the Laboratories of H.M. Fuel Research Station, has carried out the carbonization of sugar in the laboratory assay apparatus with the following results:

Amount Experimented With, 2·3 Grms.

Temp. °C.	Time.	Behaviour.	—
180	10.32	No gas. No change.	
200	10.34	Melting.	
220	10.36	Melted.	
240	10.40	Browning and frothing—the viscous material blown into thin films. Gas evolution; water distillate.	
250	10.43	Rapid evolution of gas.	
270	10.48	Vigorous frothing; charring of the bubble walls and films. Light-brown coloured distillate.	
290	10.51	Gas evolution 9 c.cm. per min.	
316	10.54	Black residue consisting of thin films. Gas evolution still strong.	
332	11. 4	Gas evolution still strong. Further flaking of carbon substance.	
344	11. 9	Gas 8·75 c.cm. per min.	The carbon residue is becoming infusible, and the blowing of even minute bubbles has ceased.
374	11.21	Gas 7·0 " "	
380	11.28	Gas 7·0 " "	
398	11.37	Gas 5·5 " "	
400	11.44	Gas 3·75 " "	
420	11.55	Gas 3·5 " "	
468	12.20	Gas 3·0 " "	
484	12.30	Gas 3·0 " "	
495	12.35	Gas 2·75 " "	From this stage little or no fresh gas was evolved; the gas measured mainly resulting from the expansion of the gas in the apparatus through rising temperature.
500	12.40	Gas 2·5 " "	
508	12.39	Gas 2·5 " "	
516	12.55	Gas 3·0 " "	
528	1. 0	Gas 2·5 " "	
540	1.15	Gas 2·0 " "	
550	1.25	Gas 1·75 " "	
556	1.32	Gas 1·25 " "	
562	1.38	Gas 1·25 " "	

These results are not strictly comparable with my own experience on single minute crystals, owing to the difference in scale, which was in the ratio of 1:1000; but taking into account the

very great difference in the scale of the operations, and therefore in the part played by the time limit, the results are in fair agreement.

Mr. King has also carried out carbonization experiments in crucibles over a wider range of temperature, to determine the density of the vitreous carbon. At a temperature of 850° C., a specific gravity density of 1·8 was reached. Winter and Baker* obtained a carbon of specific gravity 1 76 by heating for four hours at 900° C. After heating for 40 hours, the specific gravity rose to 1 84. Foster† found that sugar charcoal prepared at high temperature contained 95 p.ct. of carbon and 1·1 p.ct. of hydrogen.

Moissan used lampblack as a standard of comparison in his study of amorphous carbon. He states that the lampblack was purified by successive washings with benzene, alcohol, and ether. This is absolutely necessary; and the quantity of hydrocarbons so removed was considerable. After the ether washing, the air-dried powder is placed in an oven, and the temperature slowly raised to 150° C.

This lampblack floats on allyl iodide of 1·87 density, and sinks in propyl iodide of 1·78 density.

Lampblack so prepared is far from pure. It holds tenaciously small quantities of hydrocarbons and water, from which it cannot be freed. It contains also a little nitrogen.

To analyze this variety of carbon, it is first heated *in vacuo*, at the softening-point of glass, in order to cause it to polymerize and to be handled more easily. Some water and traces of hydrocarbons are set free. The black powder then gives the following figures:

(*These were two different samples.*)

	No. 1.		No. 2.
Ash.	0·22	..	0·34 p.ct.
Carbon	93·21	..	92 86 „
Hydrogen	1 04	..	1·20 „

If the hydrogen be expressed as water, it is seen at once that the figures add up to more than 100, which shows that a small amount of hydrogen, less than 1 p.ct., is still there in the form of hydrocarbon. The remainder comes from the water, whose complete removal from lampblack is not possible.

For our present purpose, the significance of the foregoing analytical results, taken in connection with the physical properties of carbon produced from substances of known composition, is that its vitreous character becomes more marked as the state of elementary purity is approached by the driving-off of hydrogen or hydrocarbons. Though the bubble sponge structure must be regarded as a survival of the fusible state and the evolution of gases, the fact remains that long after this stage of carbonization has been passed, the material retains its glass-like character, and even the thinnest bubble walls are still vitreous.

Graphite.

The conversion of the so-called amorphous forms of carbon into graphite by their exposure to high temperatures is well recognized, not only among scientific workers, but in industry. Whether this operation can be simply explained as the natural passage of the vitreous to the crystalline state, which occurs in a great variety of substances at a temperature much short of the liquefying point, is, I think, still unproved. Experience in matters physical shows the need for caution in accepting what appears to be the most simple explanation of any phenomenon; and in this particular case the suggestion of Sir William Bragg that hydrogen may possibly take part in the building-up of graphite, supplies a definite reason for the suspension of judgment.

I can only refer very briefly to the significance of the suggestion that, in addition to the crystallic forms of carbon, diamond, and graphite, there is a third form, which is vitreous and of lower density than either of these. If it is ultimately confirmed that vitreous carbon has a density of 1·85, as compared with 3·55 in diamond and 2·25 in graphite, interesting questions arise in regard to the atomic packing in the vitreous state which may have an important bearing on the whole theory of the rigidity of solids.

The relatively close packing of the atoms in diamond seems to fall naturally in line with the extreme hardness and rigidity of carbon in that form. The sectile quality of graphite, which causes it to flow like a liquid under moderate differential pressures, and to act therefore as one of the most trustworthy of lubricants for moving surfaces under high pressure, is associated by Sir William Bragg with the alternation of closely-packed layers in diamond formation with layers of wider spacing in which there is room for a layer of hydrogen atoms. The graphite which flows under differential pressure is composed of ultra microscopic plates of diamond hardness, which slip over each other with the freedom of a liquid. The question now arises, by what atomic arrangement can we account for the extreme hardness and rigidity of vitreous carbon in which the packing is on the average more open even than it is in graphite?

Two points emerge very clearly from the consideration of the physical properties of the three forms of carbon. These are that the ultimate atoms of carbon in the solid state must in themselves possess great rigidity and hardness, and that the cohesive force within the molecule under the influence of which these atoms are built-up in the rigidity of the vitreous state must be used with a much higher efficiency than it is in the case of graphite.

* "Journal Chemical Society," 1920, 117, 319.

† "Chemical News," 65, 152.

The Micro-Structure of Coke and Charcoal.

The method of section cutting of coal developed by Mr. Lomax has placed in the hands of palace-botanists the means whereby the microscopic study of the constituents of coal, as they occur *in situ* in the bands of which coal seams are built-up, can be pursued on the well-established lines familiar to botanists and biologists—that is, by the examination of extremely thin transparent sections. From the microscopist's point of view, this method has many advantages. Not the least of these is that the examination can be made by light transmitted from below the stage of the microscope, which passes through the section directly into the object glass. This means that light of any desired intensity can be used under the most critical conditions, and, further, that lenses of the highest resolving power can be employed, as there is no limit to the nearness of approach of the lens to the object. With lenses of high resolving power the picture as received at the eyepiece is a presentation of the object strictly in two dimensions. When lenses of longer focus and lower resolving power are used, however, the third dimension comes into the picture to a limited extent, and some idea may be gathered of the structure of the object as a solid.

For the study of the micro-structure of coke and other carbonaceous residues, this method of section cutting is only available to a very limited extent. Carbon in this form is black by reflected light, but in very thin layers or films is brown by transmitted light. In the sponge-like form in which it occurs in coke, it is glass-like and brittle, and is a peculiarly difficult material to prepare in the form of sections thin enough to be of any value for microscopic examination by transmitted light.

In a most interesting paper by Dr. Wilhelm Thorner, in 1886, on the "Study of Coal, Coke, and Charcoal,"* he described how he succeeded in obtaining, by grinding, thin sections of specimens of coke obtained from a number of different sources; and photo-micrographs of these at a magnification of 50 diameters are given in the original paper. These serve to show the inadequacy of this method for the study of the minute structure of coke. They are not even complete pictures in two dimensions, but are simply black and white silhouettes produced by light passing through holes in an opaque screen, which to all appearance is absolutely structureless. That Dr. Thorner did not recognize the limitations of this method of examination is quite clear, for he says:

> Coke made in gas-retorts is the most unlike charcoal. It presents in various degrees massive pore-walls with large cells which might almost be called caves. The coke substance is melted-down until it has become an extremely close impermeable glassy mass.

My earlier work on the micro-structure of solids has shown the importance of bringing into view all three dimensions of the structure under investigation; for however minute the elements of structure may be, they are solids of definite form which must be seen in relief if their nature and origin are to be properly understood. From the microscopist's point of view, this means that lenses of great depth of focus must be used, even though this necessarily involves a serious sacrifice of resolving power. Visually the heights and depths of a structure can be followed with the microscope by focussing up and down, even with lenses of fairly high resolving power; but when photo-micrographs are desired, only lenses of long focus and lower resolving power can be used. With this object, planar lenses of 4·5 cm. and 7·5 cm. focus were employed, and satisfactory photographs were obtained at magnifications from 5 to 12 diameters; the surface of the object being illuminated by a beam at an angle of about 45°. The more intimate structure was directly examined, using a 16 mm. apochromat of N.A. 0·3; the surface being preferably illuminated by reflected light from a north sky slightly condensed on the object by a double convex lens.

(*To be continued.*)

* "Stahl und Eisen, Zeitschrift der Norwestlichen Gruppe des Vereins deutscher Eisen und Stahlindustrieller und des Vereins deutscher Eisenhuttenleute," No. 2, February, 1886.

Coal Tar as a Timber Preservative.

In Technical Paper No. 268, which has just been issued by the United States Bureau of Mines, Mr. W. W. Odell deals with the use of coal tar as a timber preservative. By far the largest proportion of the tar used for preserving timber is mixed with creosote oil. Though it is generally understood that some of the tar distillates are superior to tar for preserving timber—especially when the proportion of free carbon in the tar is high—the difference in first cost favours tar. When used for treating timber, the tar should be hot and free from water; and to obtain the best results, the timber treated should be as dry as possible, as the absorption and penetration is considerably greater under these conditions than when the wood is moist. The penetration into the wood is not so great with tars with a high content of free carbon as with those of a low free-carbon content. The amount of preservative required per unit of area with the brush method is greater for tar than for tar distillates. The exact amount cannot be stated by a figure universally applicable, because the condition and sort of wood, as well as the quality and kind of tar, affect the results. However, it can be said that a gallon of hot tar will cover approximately 200 sq. ft. of the surface of smooth, dry poles. More tar is absorbed by dry, rough-sawn timber; and a gallon of hot tar will cover 150 to 200 sq. ft. of such surface.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

Spring General Meeting at Wolverhampton.

ON the invitation of the President (Mr. W. H. Adams, Engineer of the Bilston Gas Light and Coke Company), the spring general meeting of the Association was held at Wolverhampton on Thursday, May 25—pressure on our columns unfortunately permitting only a brief reference to it in last week's issue. The weather conditions were perfect, and about a hundred members availed themselves of the opportunity of visiting the Metropolis of the Black Country, and inspecting the up-to-date equipment possessed by the Wolverhampton Gas Company at their large works on the Stafford Road, under the control of Mr. P. G. Winstanley.

Prior to the visit to the works, the members were the guests of the Directors of the Bilston Gas Company at lunch at the Victoria Hotel. Mr. Adams was in the chair, and was supported by the Mayor of Wolverhampton (Mr. J. Thompson), Mr. A. B. Hanbury Sparrow, J.P. (Vice-Chairman of the Wolverhampton Gas Company), Mr. S. Loveridge, Mr. L. Smith, Mr. T. B. Adams, Mr. H. Holcroft (Chairman of the Bilston Gas Company), Mr. W. Hughes (Chairman of the Bilston Urban District Council), Mr. A. J. Arlidge, Mr. F. Pinson, Mr. H. Pooley, Mr. J. F. Bell, Mr. J. W. Hall, Mr. P. N. Langford, Mr. P. G. Winstanley, and Mr. A. Jones.

After the Loyal Toast had been honoured,

Mr. H. POOLEY proposed "The Town and Trade of Bilston." He remarked that Bilston was an important town, and the industries were such that their products came into the daily life of most of those present.

Replying to the toast, Mr. WALTER HUGHES said that years ago Bilston was a mining area, and depended largely upon coal for its existence. Later they had the iron industry, and also the unique privilege of providing the first man to use gas for the purposes of manufacture. In the course of time the mines became worked-out; and unfortunately those who worked the mines for their own profit and benefit did not consider the future generations to the extent that they should. When the mines developed, there was an influx of labour, and the idea seemed to be to put-up as many houses as possible in a given area. This was the problem they had to tackle when the mines gave out; but fortunately they had men of intelligence and business ability who started new industries.

Proposing the toast of "The Bilston Gas Light and Coke Company," Mr. P. N. LANGFORD (Vice-President) said they had heard what a progressive town Bilston was with regard to its manufactures; and this, to a large extent, must be due, he thought, to the progressive manner in which the Bilston Gas Company had conducted their operations during a large number of years. Many years ago, the Bilston Gas Company were in a precarious position; but thanks to the esteemed Chairman, and his father, who had the gift of seeing into the future and preparing for it by the erection of new works and the raising of fresh capital, it was now one of the soundest companies in the country. Bilston gas cost 4s. 2d. per 1000 c.ft.; and the Company must certainly be congratulated on having a price as low as that at the present time. Their President, Mr. W. H. Adams, who had always been so helpful and willing in the giving of wise advice, had been with the Company for sixteen years; and he (Mr. Langford) would like to congratulate the Company on having as chief executive officer a man of such ability as their President. ["Hear, hear."]

Mr. H. HOLCROFT, in reply, said they were delighted to meet the members of the Association that day. "We are," he remarked, "in a fortunate position in the gas industry, inasmuch as we are able to pool our brains—that is to say, we are not competitors. It is not war to the knife between gas companies at all, as perhaps it would be in many independent undertakings. We meet on occasions like this; and anything that is good to the industry which any member produces, can be given freely and wisely to all." The gas industry could be congratulated on the great progress it had made through the last few years. He mentioned that the Directors of the Wolverhampton Gas Company had at once acceded to the suggestion of a visit by the members of the Association to the Wolverhampton Gas-Works, because the latter were on a larger scale, though on the question of comparison he went so far as to say he was very pleased with their own little works at Bilston, which dated back to somewhere about 1840. He had been on the directorate about forty years, and had been Chairman twenty years; and he was proud to think of it as a very fair record. [Applause.] He should like to express his satisfaction at the fact that the Association had chosen the Company's Engineer as President; and he congratulated the members on their very wise selection.

The toast of the "Wolverhampton Gas Company" was submitted by Mr. J. FERGUSON BELL, who said that in Wolverhampton and Bilston they had examples of excellently conducted enterprises serving the community as well as any local authority could do. The Wolverhampton Gas Company was formed over a hundred years ago; and to-day the consumption in Wolverhampton and district was something over 1200 million c.ft. The Company, by a conservative policy, by looking after and studying the interests of the consumers, had grown year by year until they now stood pre-eminently one of the most successful companies in the Midland Counties. All great companies had been through difficult times. During the war, the Directors and shareholders said: "Our country comes first;" and though much money was lost, he felt sure that in the future they would receive their due reward. In Wolverhampton the Company did everything they could to serve the community. He saw that the maximum price in Wolverhampton was one of the lowest in the Midlands.

Mr. A. B. HANBURY-SPARROW (Deputy-Chairman of the Company), replying in the absence of the Chairman, Col. H. H. Ward, J.P., tendered thanks on behalf of the Board for the kind things said about the Company. Their great wish was to benefit the consumers as much as they could, consistent with the reasonable interests of their shareholders. They lived in troublesome times, but had kept their flag flying; and he hoped they would soon be in smooth waters, and attain their ambition to supply gas to Wolverhampton of the best quality at the very lowest cost possible.

Mr. J. W. HALL, proposing the toast of "The Midland Association of Gas Engineers and Managers," spoke of organization, good judgment, and careful arrangement, and said such a combination would often defeat superior appliances possessed by other works which lacked in a degree the above essential qualities. He thought the chief advantage of such an Association as this was the *camaraderie* and good feeling engendered.

The PRESIDENT, who replied, said it was one of the traditions of the Association that, as engineers, they should give each other advice and assistance; and in that respect they would have later on in the day an excellent example—the inspection of the up-to-date plant of the Wolverhampton Gas Company. As to his relations with the Board of the Bilston Gas Company, they had always been of a most pleasant description.

VISIT TO WOLVERHAMPTON GAS-WORKS.

Subsequently the members were conveyed by special cars to the works of the Wolverhampton Gas Company at Oxley, where, under the guidance of Mr. P. G. Winstanley (the Engineer) and Mr. Arthur Cranmer, a tour of a remarkably interesting nature was made. Members were aided by a description of the works prepared by Mr. Winstanley, of which the following is a summary:

The Wolverhampton Gas Company was formed in 1820, and the first works were in Horseley Fields, adjoining the canal. In 1848 a site of 5½ acres was acquired on the Stafford Road. New works were built and enlarged from time to time, until in 1897 the construction of a complete new section was begun on 9¼ acres of land, which had been bought on the other side of the canal in the Parish of Bushbury. This section was designed and constructed by Mr. George Winstanley (then of Coventry), and was brought into work in the autumn of 1898; only half the arches in the retort-house being filled. In 1899 the remaining arches were filled; and the works as completed were capable of making 2,500,000 c.ft. of gas per day.

The retort-house contains 24 beds of eight inclined retorts each, heated on the Winstanley regenerative system. Adjoining is a covered coal-store, holding 3000 tons. Coal is discharged from an overhead railway either into stock or to a breaker, from which it is elevated to the overhead storage hoppers in the retort-house. Inside the retort-house is a second breaker, fed by a conveyor from the gable-end of the house, where coal is unloaded from wagons or taken from the stack on the storage ground.

The coke is removed from the retort-house by an electric telpher, and is either stacked in the yard or elevated to the screening plant and placed in the reinforced concrete bunkers, from which it can be loaded by gravity into railway wagons or cars. The telpher track runs completely round the retort-house, and has proved a most convenient means of handling retorts, retort-house castings, and many other materials.

From the retorts the gas passes through annular and tubular condensers; each set being of 2½ million c.ft. capacity.

The underground tar and liquor wells are 30 ft. and 40 ft. in diameter respectively, by 20 ft. deep.

There are two Lancashire boilers, one 30 ft. by 8 ft. 6 in., and the other 28 ft. by 6 ft. 6 in.

The exhausters are of the reciprocating pattern (by Messrs. R. & J. Dempster), and are of 100,000 c.ft. per hour nominal capacity.

On leaving the exhausters the gas passes through a Livesey washer and a Holmes washer-scrubber to two tower scrubbers, each 70 ft. by 13 ft. 4 in.

The tar and liquor pumps are housed in a room behind the exhauster room, and next to the pump-room is a small fitting shop. Over these is a store; and above the store are the overhead fresh water and liquor tanks.

The purifiers are six in number, 30 ft. by 30 ft. by 6 ft., on the ground level; the last two being catch boxes. Above the purifiers is an oxide floor. The oxide is raised from the boxes by a friction hoist, passed through a disintegrator, and refilled into the purifiers through canvas shoots.

The station meter is of 100,000 c.ft. per hour capacity. On its way to the holders the gas is sprayed with paraffin at about 45 lbs. per sq. in. pressure.

There are five holders, varying in capacity from 1,100,000 c.ft. to 360,000 c.ft.; the total storage room being 3,050,000 c.ft.

It is interesting to note that in 1862 Messrs. Glaisher and Coxwell filled from one of the smaller holders the balloon in which they made their famous ascent, probably on a spot near the

valve-house. The height reached was 7 miles, and is still a record.

There is a benzole extraction plant capable of extracting the crude benzole from the washings of three million c.ft. of gas per day; and a sulphate of ammonia plant of 3 to 4 tons of salt per day capacity.

On the Stafford Road site there are three sets of carburetted water-gas plant by Messrs. Humphreys and Glasgow; two making one million c.ft. each, and one making 750,000 c.ft. per day when using 2¼ gallons of oil per 1000 c.ft.

To supply steam for this plant and for other purposes there are three Lancashire boilers—one 30 ft. by 7 ft. 6 in., and two 26 ft. by 6 ft. 6 in.

In the engine-room are duplicate turbine-driven blowers, three rotary exhausters, and the oil and water pumps. The sets are fitted with blast products purifiers. The whole of this plant is housed in a disused retort-house, together with duplicate compressors for supplying gas at high-pressure to the village of Codsall, five miles distant.

The water-gas purifiers are four in number, 30 ft. by 20 ft. by 6 ft., and are in a building which formerly contained the purifiers for the old coal-gas plant now dismantled.

The output of gas having risen from 772 million c.ft. in 1914 to 1114 million c.ft. in 1919, it was necessary to make considerable extensions to the plant; and as the section built in 1897 was a complete unit in itself, working up to its full capacity in the winter, any extension also had to be a complete unit, from retort to meter.

The plant erected under this scheme consists of four beds, each containing four Woodall-Duckham 5-ton vertical retorts, to make 1,200,000 c.ft. of gas per day when steaming the charges; additional coaling plant; water-tube condensers; exhauster; Pelouze tar-extractor; Kirkham-Hulett washer; and reinforced concrete purifiers.

These purifiers are 40 ft. by 40 ft. by 6 ft. 6 in., and are on columns, the space underneath being used as a revivifying floor. There are four covers to each box, 16 ft. by 16 ft.; and these are raised by a travelling crane. The oxide is discharged through openings in the floor; and the boxes are filled from the overhead oxide floor of the 30 ft. purifiers by means of a portable band conveyor. Some difficulty was found in making tight the joint between the concrete and the cast-iron curb round the top openings; but this was overcome by the application of three coats of bitumastic paint. The Engineer is indebted to Mr. A. E. Broadberry, of Tottenham, for his kindness in giving much valuable information and many useful hints when the adoption of this system of constructing purifiers was under consideration.

A rotary station-meter is also included in the plant erected under the above scheme.

In addition, the electricity generating plant had to be increased to supply the extra current needed. A new 112 KW. set, driven by a National gas-engine of 170 B.H.P. was put down, and two small sets were removed from the exhauster-house. All this plant was placed in a new building of reinforced concrete.

The vertical retorts were put to work in September, 1921, but owing to various unavoidable delays the whole of the new plant was not ready for some months later. It is now complete, and the capacity of the coal-gas works is 3 600,000 c.ft. per day when steaming the vertical retorts. The total capacity of the works when making normally carburetted water gas is 6,350,000 c.ft. per day.

The governor-house is on the Stafford Road site, and the gas is distributed through 24 in., 16 in., and 12 in. low-pressure mains governed by Parkinson governors, and a 4 in. high-pressure main. In addition there is a 14 in. low-pressure main from the Bushbury works supplying the Heath Town district.

In the same building as the governors are two Bryan Donkin boosters, each able to pass 400,000 c.ft. of gas per hour against 7 in. pressure difference.

The total area occupied by the works is 15 acres; and the Company have a further 15 acres on the other side of the L. & N.W.R. Viaduct available for future extensions.

The works are served by both the London & North Western and Great Western Railways; and the Company's private sidings are so arranged that coal and other materials can be delivered to almost any part of the works by their own locomotives.

The Birmingham Canal runs through the middle of the area, and there is a branch to a private basin on the Bushbury side.

The Directors of the Company, it should be mentioned, are Lt.-Col. H. H. Ward, J.P. (Chairman), Sir Geo. H. Holcroft, Bart., and Messrs. A. B. Hanbury Sparrow, J.P., J. W. Tilley, S. Loveridge, L. T. Smith, and W. P. Gibbons; and the Secretary is Mr. A. Jones.

BUSINESS MEETING.

Members sat down to tea at the Queen's Picture House, and were welcomed by the President and Mrs. Adams. Later a short business meeting was held.

The PRESIDENT referred with great regret to the death of their friend and Treasurer, Alderman Cooper, whose worthy attributes, he said, were known to most of the members. The members stood silent for a moment in honour of the memory of their late colleague.

ELECTION OF MEMBERS.

The following were elected members of the Association: Mr. Harold Davies, Engineer of the Chesterfield gas undertaking; Mr. T. F. E. Rhead, M.A., Chief Chemist, Birmingham Gas Department; and Mr. W. Wilson, Gas Engineer, Swadlincote.

EMERGENCY FUND DONATIONS.

The PRESIDENT made reference to a donation of 20 guineas given to the Emergency Fund of the Association by the Redditch Gas Company. In a letter to Mr. James Paterson, who was then President, the Chairman of the Company intimated that the donation was made out of regard for, and as an act of appreciation of, the services rendered by the Company's officials who were members of the Association. The President said it was a fine thought, and one the Association appreciated very much. There was another donation of 10 guineas sent by Mr. E. L. Adlington, who said it was given by a friend of his. He moved that a hearty vote of thanks be given to the Redditch Gas Company and to Mr. Adlington's friend.

Mr. W. S. MORLAND (Gloucester) seconded, and said the donations to the fund which had just been started would be very beneficial. Circumstances arose now and then which no one could foresee; and it was necessary that such a fund should be available. Mr. Paterson's pleadings had had most excellent results.

The resolution was cordially passed.

Mr. L. E. CLIFT (Chairman of the Redditch Gas Company) said he would convey the kind resolution to his Board. The donation constituted a tangible vote of thanks and a practical recognition of the help of the Redditch Gas Company's officials during the past year. He threw out the hint that the vote of thanks to gas company officials by the Directors and shareholders of companies should exist in the more concrete form of a donation to the Emergency Fund.

The meeting concluded with a vote of thanks to the President and Mrs. Adams. Mr. W. G. S. CRANMER (Willenhall), who moved it, described it as placing the coping stone on the day's proceedings.

Mr. B. W. SMITH (Walsall) seconded; and in acknowledgment the PRESIDENT said it had been a most successful day.

Efficiencies and B.Th.U. Values.

Discussing, before the Southern Gas Association of the United States the question of the advisability of adopting a lower heat-unit basis, Mr. E. L. Rieha, of Baltimore, pointed out that, while 200 c.ft. of 500 B.Th.U. gas produce 100,000 heating units, 250 c.ft. of 400 B.Th.U. gas equal the same total of heating units, at an increase of 50 c.ft. But, he said, there are few operations in which the entire 100,000 B.Th.U. are applied all at once. If we take the usual gas-fire requiring 10,000 B.Th.U. per hour, the difference in volume of gas consumed would be only 5 c.ft. spread over the hour. Furthermore, a point in this connection to be well observed is the fact that the volume of air supplied for complete combustion in the mixture with the lower heating value gas is smaller than in the case of the higher B.Th.U. gas, thus affecting flame temperature adversely with the latter gas. He quoted one typical case of the waste that occurs with a high B.Th.U. gas employed in the usual class of stove burner for boiling. Here there was a gas of 563 B.Th.U. that gave an efficiency of 34·66 p.ct. with the supply-cock full open, and consumed 15¼ c.ft. per hour at a district pressure of 28-10ths. With the tap about half-open, and the flame touching the bottom of the kettle, the efficiency was 39·77 p.ct., using 10½ c.ft. per hour. The consequence was that 45·4 p.ct. more gas was used with the tap full-open than when half-open; and there was a further decrease in efficiency of 5·11 p.ct. Later investigations proved that many appliances in similar districts gave almost identical results; and assuming that the average conditions are only half as bad as these tests indicate, it shows that in most towns, at all events, there would be no perceptible increase in volume delivered, even if the quality was reduced below 450 B.Th.U. These wasted B.Th.U. are not only a nuisance to the householder, but a vital cause of excessive gas bills as well.

Carbon Monoxide.—Among papers at this month's meeting of the Institution of Mining Engineers, in Sheffield, is one by Mr. A. P. Veale, on "The Rate of Absorption of Poisonous Amounts of Carbon Monoxide by the Blood."

A Conference that Should have Results.—There will shortly be appointed a Joint Committee from the American Institute of Architects and the American Gas Association, to confer on ways and means by which the two organizations can be mutually helpful.

North British Association of Gas Managers.—The Council have decided that the annual general meeting of the Association shall be held at Ayr, on Thursday, Sept. 7. There will be an excursion on the following day; and the annual golf match will be played at Barassie, or Western Gailes, on the afternoon of Wednesday, Sept. 6.

Correction.—In the paragraph in our issue of May 31, relating to the Bill of the North-Western and Midland Railway Group and the proceedings in Committee, it was stated that "among the witnesses on the opposition side we noticed Mr. William Cash, F.C.A." "On the opposition side" should have been "on the promoters' side."

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Auxiliary Meeting.

The Sixth Half-Yearly Auxiliary Meeting of the North of England Gas Managers' Association was held at the Tynemouth Gas-Works, North Shields, on Saturday, May 27; the chair being taken by Mr. W. E. OULDS, of Tynemouth.

The HON. SECRETARY (Mr. A. H. Bagshaw) read letters of apology for non-attendance from Messrs. Hovey and Galleway, and also a letter from Mr. F. C. Willis (Tynemouth) extending a hearty welcome to the members of the Auxiliary Section of the Association on behalf of his Chairman and Directors, and wishing the meeting every success.

The CHAIRMAN then delivered an address on

GAS AS IT AFFECTS HOUSING SCHEMES.

He said it appeared to him that the housing schemes which had been undertaken by local authorities, with the aid of a Government subsidy, afforded a unique opportunity for securing the adoption of gas for lighting as well as for heating and cooking. The Ministry of Health had for some time advocated the use of gas for many purposes; but unfortunately they were somewhat difficult to move in bringing about a satisfactory settlement with regard to the financial difficulties, which for the past few years had existed with gas companies and local authorities.

It was his intention to place before the meeting general information touching briefly upon the several points in connection therewith as they affected the Gas Company which he had the honour to serve. About two years ago, one of the local authorities in their area of supply commenced one of their Government-aided housing schemes, which consisted of the converting of an Admiralty hostel which had been erected by the Government in the later period of the war, but not actually used, and which was wired for electric lighting.

The work of conversion resulted in the premises being made into 44 artizans' dwellings, all of which were eventually equipped with electric lighting fitments. The Company were then approached regarding the laying of the necessary mains and services. On inquiry as to what the gas was to be used for, they were informed that it had been decided to instal a gas-heated wash-boiler in each house; and they found that quite seriously members of the Housing Committee who had the scheme in hand had concluded that the Gas Company would be willing to bear the full expense of laying mains and services and fixing meters for supplying gas to these wash-boilers which were being installed by the Housing Authority. After lengthy discussions and many deputations, they were able eventually to secure an arrangement whereby the authority in question agreed to fix, at their expense, three gas-fires in one-half of the houses, and to subsidize the Company to the extent of the cost of a gas-griller in all. It cannot be said that this scheme was financially a success to the Company; and the loss on the lighting was very disappointing, seeing that strenuous efforts were made to secure this. The fact that the premises were already wired for electricity was, of course, the main factor against the adoption of gas for lighting.

Immediately after the completion of the scheme, the Authority in question embarked upon the erection of a much more extensive housing estate, comprising 257 houses of the usual type which has been built more or less throughout the country under Government-aided housing schemes. Here, again, it was almost a foregone conclusion that electricity would be adopted for lighting purposes, and that the Gas Company would be asked to instal mains, services, and meters for wash-boilers and any other heating or cooking apparatus that might eventually be rented by the tenants. While practically every gas undertaking had been confronted with the same problem in a greater or less degree, it might interest the members to know that, in their case, as the result of persistent effort and long-drawn-out negotiations, not only in their Board Room, but in the Council Chamber and at the Ministry of Health, Whitehall, they at last succeeded in bringing reason and better judgment to bear in this difficult problem, with the result that the case for a dual supply of gas and electricity fell to the ground, and they were able at last to receive, upon fairly satisfactory terms, an all-gas service for the houses of this estate, including gas for lighting as well as for the supply to wash-boilers which were installed by the Housing Authority, and also any business that might be obtained direct by way of gas fires, cookers, grillers, or boiling burners.

In the negotiations the Company were guided by one important fact—namely, that this estate was being developed in close proximity to a local colliery, where cheap coal, and no doubt, in many instances, free coal, would be eventually available to the tenants; and there was not much prospect of gas being utilized to any extent other than for wash-boilers. It was largely on account of their firm attitude in pointing out this and other factors, such as the grave waste of public money in the providing of a dual supply where one system of pipes—namely, that supplying their principal commodity—would give the complete lighting and heating service that the Gas Company eventually secured the satisfactory terms they did.

It was, of course, necessary for them to emphasize very strongly the utter impossibility of any gas scheme at that time working-out as a satisfactory commercial proposition unless a very considerable proportion of the cost was borne by the Housing Authority or the Government; and it would be seen from the actual agreement that these arguments resulted in a fairly just arrangement. One very important and helpful fact was the entire elimination of reinstatement charges for either mains or services; and in this respect, and also bearing in mind the fact that the Housing Authority undertook the carcassing of the houses for lighting, they were relieved of a considerable outlay.

It might interest the members to learn that the actual time taken to negotiate this scheme, from the date when they were first approached by the Housing Authority to the date of the sealing of the agreement, was slightly over twelve months. Similar agreements and terms had since been obtained in the case of two other Housing Authorities—one comprising an estate of 182 dwelling houses, and the other 226. All the work on the first-named estate was completed about a month ago, and the mains and services on the other two estates were more than half complete.

MAIN-LAYING POLICY.

There was one matter of special interest in connection with the work which had had to be undertaken by gas companies and corporation concerns in connection with these schemes which might be discussed. This was with regard to the policy of laying one central gas-main to supply the houses on each side of the streets, or double mains laid one in either footpath. In their case, after careful consideration and weighing not merely the present-day costs but their future liabilities, they came to the conclusion that it would be a mistake to revert to the old policy of laying a single main down the centre of the roadway. Experience had shown that a main in such a position, with its attendant long services leading away on either side across the main thoroughfare, was a very unsatisfactory method in practice, particularly having regard to modern road traffic. It was found that services of such a length as was necessary in the case of a central main inevitably caused more trouble than a shorter service, and, in the case of a total stoppage, rendering an examination or relay of the service necessary. The difficulty of carrying out the work and the expense of reinstating the road surface both contribute very seriously to the heavy cost of maintenance of mains and services. It might be argued that the price of laying two mains at such a time was prohibitive, and more than outweighed such disadvantages; but it was thought that the extra length of service piping and the heavier maintenance charges where one central main was adopted, compared with the freedom from interrupted supplies where there was a main on either side, tended to make the balance decidedly in favour of double mains. There was also the great advantage that mains in the footpath were, as a rule, freer from the vibrations caused by heavy road traffic, and there was less liability to fracture when road surfaces became as bad as had been the experience of the past few years.

It might be argued that a leak in a footpath, being nearer the dwelling houses, was a more fruitful source of danger than in the centre of the road. Going upon past experience, however, it was found there was much greater tendency for leakages, due to drawn joints or fractures, to occur in the road than in the footpath; and as central mains were more often than not in close proximity to main sewers and inspection chambers, there was at times a distinct danger arising from the possibility of gas leaking from such joints or fractures and entering sewers, thereby passing along secondary drains into the interior of dwellings or other property.

In the largest scheme referred to, which had double distributing mains in each street, the total length of the mains (comprising 8 in., 7 in., 6 in., and 4 in.) amounted to 2659 yards. In the case of the other two estates, which also had double mains throughout, the total lengths amounted to 1983 and 1662 yards respectively—making a total for the three schemes of 6304 yards; or, with the addition of one 10-in. trunk main, 834 yards in length, and one 6-in. ditto 757 yards long, the total length of main amounted to 7895 yards, or nearly 4½ miles—a problem of no mean dimensions when considering the very heavy capital outlay. The service piping in connection with these housing schemes—in fact applied generally throughout their district for some time past—was 1 in. diameter.

SERVICES.

It might be opportune at this moment to describe briefly a service which it was their practice to lay. The main was drilled, and a 1-in plain ferrule screwed into it having a short length of 1-in. lead piping about 2 ft. 6 in. over-all attached thereto by means of an ordinary solder joint. At the opposite end of the lead pipe a 1-in. full-way cock, with coupling union attached, was fixed, and a cast-iron case fitted over same and flush with the surface of the pavement. From the service cock a 1-in. wrought-iron tube, having a gradual rise towards the meter, was carried forward to the interior of the premises and connected to a short piece of lead pipe with a meter cock to the inlet of the meter (which was usually placed upon a shelf in a dry situation in the cupboard under the staircase), and a syphon or drip pipe fixed on the outlet connection to prevent any condensation draining back into the meter. The object of fixing a stop-cock in the pavement was that, in case of fire, the gas supply could be easily turned off. Furthermore, in case of any obstruction accumulating in the service pipe, which could not be removed by the use of a force pump, the lead piping might be easily disconnected at the coupling

ferrule and the obstruction removed from the pipe (not blown back into the main) by wiring, at a minimum cost for labour and reinstatement charges.

All wrought-iron service pipes were coated externally with bitumastic solution, and also received a protective covering of tarred sawdust, which had proved a very good protective medium and considerably lengthened the life of a pipe of this description. They had adopted this method and exercised great care in this direction in order to keep-down working costs, which, to some extent, had compensated for the high rate for wages and materials. They had also utilized for service work a weldless steel tubing wrapped with jute cloth and coated with bitumastic solution.

Interior Piping.

In piping the interior of houses in a residential area, it was the usual practice to run a ¾-in. lead pipe from the meter outlet up to the first branch leading to the lights, and to carry forward into all sculleries a pipe of not less than ½ in. diameter, in order to provide an adequate supply of gas for cooking and boiling appliances; no piping of less than ⅜ in. diameter being used for single lights. It was not advisable to use iron pipes for this work, where the pipes would be covered and not easy of access. In fixing the pipes, particular care was taken to give a fall from the lights to the meter. All downward bends or hollows in the pipes where water might lodge were avoided; but in cases where this could not possibly be done, a small tap was fixed at the lowest point of the bend or pipe, so that any accumulation of water might be drawn off. All pipes, where not embedded in plaster, were run along wood strips, not less than the external diameter of the pipe, secured to the walls or joists. The pipes should on no account be hung on nails or otherwise insecurely fastened; hooks of a suitable pattern being used for keeping the pipe in position. All floor boards which covered pipes were fastened with screws, so as to be easily removed to afford access.

A set of regulations to be observed by local gas-fitters and plumbers, denoting the greatest length and maximum number of points allowed for various sizes of pipes, which would ensure satisfactory workmanship, would save much inconvenience, annoyance, and expense, which have hitherto arisen; and he would suggest that all architects, surveyors, and builders, who had the preparation of plans and specifications, be recommended to insert a clause requiring that all interior gas-piping must be executed in accordance with the regulations of the gas authority. The same thing should apply to the laying of services; and it was regrettable there had been a tendency in recent years for builders and architects to include for the laying of a portion of the services between the curtilage or fenceline of the houses to the place where the gas-meter was likely to be fixed. In view of the very unsatisfactory way in which these services were generally laid, they had recently endeavoured, in the case of every building undergoing course of erection, to get in touch with the builder or architect with a view to coming to terms for the laying of the complete service from main to meter, and were gradually obtaining complete control over this portion of the gas supply. In this way they could ensure that services were properly laid and had the correct falls, and also that the material of which they were composed was of the right quality, thickness, and dimensions.

Naphthalene.

Naphthalene—the bugbear of two generations of gas engineers—had been discussed more than any other of the undesirable bye-products of gas manufacture, and with many companies it still interfered with the proper distribution of gas; but he was inclined to think not so much as it did 20 years ago. As the main facts regarding the occurrence of naphthalene deposits had been established, so had various means for the prevention or avoidance of this impurity been more or less successfully adopted. It had been proved that drastic cooling of the gas as it left the hydraulic main, or washing the gas in suitable solvents, would to all intents and purposes eliminate the impurity at the works; while the spraying of liquid hydrocarbons into the distributing gas-mains would remove deposits of naphthalene and to a large extent prevent the choking-up of service pipes. He was pleased to state that the number of naphthalene stoppages in their mains and service pipes for the past two years had been very low; and they had reason to believe that the scrubbing plant and atomizing apparatus installed at their works, if it had not entirely eliminated the naphthalene content in the gas distributed in their area of supply, had at least reduced it to negligible proportions.

Corrosion of Iron and Steel Pipes.

A different problem from that of naphthalene was the corrosion of iron and steel distributing pipes. In this case, true corrosion—the effect of chemical action on the pipes—was implied. It was a comparatively modern trouble, whereas when gas of high illuminating power and containing condensable hydrocarbon vapours was being distributed, a protective coating gradually formed on the interior surface of the pipe. At that time lime purification was in general use, and the gas contained very little carbon dioxide and a hardly appreciable amount of oxygen. Probably the higher carbonizing temperatures now in vogue had led to the production of hydrochloric acid, which exerted a corrosive action on iron and steel surfaces, combining with the metal to form Prussian blue.

The writer had no hesitation in stating that the bulk of the complaints of stoppage of supply was due to the presence of cyanogen compounds; and it would seem that this corrosion trouble was part of the price which had to be paid for the modern development of gas manufacture in distributing more of the calorific potentiality of coal in the form of gas.

Although the removal of hydrocyanic acid from coal gas was at the present time not a commercial proposition, they ventured to hope that some relief might be found before long—it was indeed already foreshadowed—in the introduction of a cheaper and simpler method of extracting cyanogen from the gas than existed at present. It would appear that, given a moderately simple and effective process of extracting this troublesome impurity, they should, in all probability, be amply compensated in the reduced distribution costs, and with less permanent damage to business and loss of prestige, due to the annoyance caused to consumers who had to complain periodically of a short supply of gas to their premises.

High and Low Pressure System.

The speaker gave a brief description of the area supplied by the Tynemouth Gas Company by means of a high and low pressure system. The work recently carried out in the Company's area comprised an 8-in. diameter Mannesmann rigid socket steel tube, with gate valves arranged approximately three-quarters of a mile apart, between their works and the Urban District of Whitley and Monkseaton, with subsidiary 14-in. and 10-in. diameter cast-iron trunk mains. In laying the steel mains, great care was exercised in making good any damage which had occurred to the jute cloth wrapping during transit, and the precaution was taken of allowing ¾ in. clearance at the back of the inner sleeve at each joint for possible expansion. All joints of the tubes were caulked with lead wool throughout, and excellent work was being done with this form of jointing material. The interior of the pipe was very carefully cleaned by inserting a wire brush, and the spigot ends thoroughly scraped so as to form intimate contact with the jointing medium.

This main was tested in sections of about three-quarters of a mile in length, at a pressure of 50 lbs. per sq. in., by means of a portable 5-h.p. petrol-driven air compressing plant with flexible hose and dial gauge attached at one end of the main; while at the opposite end a rubber-lined wood stopper, with wrought-iron clips, was clamped to the back of the socket. Each joint was tested under this pressure with soaped water, brush, and mirror (the slightest "frothing" at the joints could be detected), then carefully set-up and made tight before proceeding with the application of the bitumastic solution and jute cloth wrapping.

The bottle syphon as designed by the manufacturers was not accepted or installed, as facilities had not been provided in its design for the cleaning-out or removal of any deposit which might accumulate from time to time; and for this reason heavy cast-iron flanged and ribbed syphons, with tail pieces and removable lids, were installed.

Recognizing from the first that it was highly important that the syphon adopted as the standard should be in every way a reliable article, having regard to the dangers arising from heavy road traffic and the high pressures under which it would be worked, their Engineer gave this matter careful attention, and a specially-designed flanged syphon, heavily ribbed and with a curved base, was prepared. The cover of the syphon was also ribbed, and of specially heavy design; the central boss for the attachment of the tube being 2¼ in. thick by 3 in. diameter. Each of the syphons had been tested at the makers' works to a hydraulic pressure of 300 lbs. per sq. in.; the interior being coated with boiled linseed oil before the test, and the exterior, after test, with Dr. Angus Smith's solution. The joints were all machined full width; and there has been no difficulty or trouble due to leakage or any other defect throughout a period of over twelve years since they were first adopted. The interiors of the syphons in special cases, particularly near the works and at the inlet of every governing station, were fitted with a curved baffle-plate to intercept and throw down any small particles of dust, corrosion, or other deposits which might be carried forward.

In the designing of this curved plate, which was constructed so as to be easily removed when the syphon required to be cleaned, care was taken to ensure that the annular space between the body of the syphon and the surface of the curved plate on the outlet side was equal to the full area of the pipe as from the level of the underside of the branches; it being assumed that the flow of gas would automatically divide into two streams along either side of the plate. In this way the full area of the pipe was assured, even in the event of the syphon filling up to the underside of the pipe with iron oxide or other deposits. It had occasionally been found that the syphon tube had gradually filled up, and upon the removal of the syphon cover it had been found that these syphons, while not always full, had occasionally contained considerable quantities of deposit, which in the ordinary type of steel bottle syphon would be practically beyond reach.

These dry deposits were more noticeable after a distance of about 2 miles from the works than in the vicinity of the compressing plant; those nearer making-up with heavy oils thrown down in the process of compression. As the result of an experience which they once had within the works, due to a syphon attendant inadvertently unscrewing a syphon tube when he was under the impression that he was removing the gun-metal plug between the pressure peaks, with the result that the tube was eventually found almost screwed out of the syphon, with a consequent heavy leakage of gas, it was decided, as a precautionary measure against such a contingency, to attach clips to each syphon tube, having arms extended on either side for about 1 ft., for the purpose of

obtaining a firm hold in the surrounding ground and effectively preventing all danger of an attendant unscrewing the syphon tube. This little device had eventually prevented any recurrence of the trouble.

They were now engaged upon the final extension, which would complete the high-pressure belt line between the Whitley and Monkseaton and the Seaton Delaval areas, a distance of approximately 4 miles, by laying a 6-in. diameter Mannesmann steel tube, as the need was urgent for the boosting up of one or two of the outlying districts during the period of maximum consumption. They realized the advantages to be derived by the linking-up of this pipe line to be very considerable, as any section might then be isolated by shutting the valves of any particular portion, and, during the period of examination, it would be possible to deliver an adequate supply of gas for all purposes through the remainder of the circuit; the compressing plant at their works supplying high-pressure gas in both directions round the circuit. The total length of steel mains in the high-pressure belt line when the Monkseaton to Seaton Delaval loop was finished would be 13½ miles.

GOVERNING.

Mr. Oulds described the Reynolds governors for the guidance of members who might not be familiar with the working of this plant. The gas before entering the governor was passed through the screen box, which had cleaning doors arranged on either side, and was fitted with baffle-plates of such an area as would so reduce the velocity of the gas as to intercept and deposit any small particles of magnetic oxide, dust, grit, or other solid matter which might be carried forward in the gas, and prevent these entering and adhering to the valves of the governors. While they had no actual working experience of this new type of screen box, they had every reason to believe that satisfactory results would follow from its introduction.

The district governing plant was in duplicate throughout. One half was intended as a reserve, so that either could be overhauled, adjusted, and tested when required; each set having inlet and outlet valves attached, and consisting of a main high-pressure governor, secondary high and low pressure governors, needle regulating valve, pressure bowl with connecting piping, levers, connecting links, &c. The main governor dealt with the heavy demand for gas, and gradually closed when the demand became small; the auxiliary governor set being then relied upon to supply the gas required. By means of this combined arrangement, any inlet up to 40 lbs. per sq. in. could be governed down to any number of tenths of an inch on the outlet with perfect accuracy—as a matter of fact, over a very considerable range of fluctuation in the demand for gas, with a consumption from practically *nil* to the maximum capacity of the governor—*i.e.*, 100,000 c.ft. per hour. The pressure recorder showed the pressures maintained at the inlet and outlet respectively.

The small No. 1 auxiliary governor reduced the inlet pressure to about 10 in. water-gauge, and the No. 2 auxiliary governor similarly reduced this pressure to that required at the main outlet, a needle valve regulating the flow of gas through these two governors. A leather diaphragm, having a large area and contained in the auxiliary pressure bowl, was exposed to the pressure obtaining between the secondary governors by means of a wrought-iron pipe, and the motion due to the varying pressure was communicated to the main governor by a connecting rod, thereby exercising a powerful lifting force on the valve spindle.

The outlet pressure was adjusted to any required amount by suitably changing the weights carried on the auxiliary bowl spindle and those on the top of the diaphragm in the No. 2 secondary governor.

Assuming that a very small quantity of gas was passing, the main governor would be closed, and the gas required would be passing through the secondary governors; the intermediate pressure of 10 in. would be acting on the auxiliary bowl and assisting to keep the main governor closed. As the quantity of gas required increased, the No. 2 secondary governor would open out until, in consequence, the intermediate pressure of 10 in. falls, because the needle valve was checking the amount of gas which could pass the auxiliary governors. As a result of this, the pressure in the auxiliary bowl would gradually fall, so leaving the main governor ready to open as soon as the secondary governors were unable to supply sufficient gas; and the main governor, gradually coming into action, would supply the bulk of the gas over the period of heavy demand.

The plant would be erected above the ground level, to afford easy access to the governors; being housed in a suitable brick building. In no instance have they had these fitted in pits under the roadway. To provide against the very remote contingency of the governing plant failing to control the pressure within a certain reasonable maximum, a mercury seal was fixed on the main outlet and the discharge pipe carried through the roof of the building. This had a seal of 10 in. water-gauge, and ensured that, in such an event, no greater pressure than that of the seal could be thrown upon the distributing mains. They had now altogether six high-pressure governing stations, including that being prepared at Monkseaton, and eight complete sets of Reynolds governing plant.

DISCUSSION.

Mr. C. S. READ (Sunderland) asked if Mr. Oulds had experienced immunity from electrolytic action by laying his mains under the footpaths instead of in the centre of the road.

Mr. W. BATT, jun. (Newcastle), asked what depth of cover was given to the mains, and if they were laid in the grass verge. He said how unsatisfactory it was when outside plumbers laid services instead of the gas undertaking, and he regretted that they could not do this in Newcastle. Plumbers there laid all services in private ground. This he considered was very bad policy. In Manchester they had authority not only to state the size of pipes, but they inspected and tested the work before the gas was put on. Birmingham had an agreement with the master gas-fitters which worked very amicably, and they specified the size of pipes. This was found to be a very good system. With regard to the drawing of the main, service pipe, and meter, he noticed that the lead pipe was brought under the floor. He would prefer to fix an iron pipe, and thus prevent danger from escapes caused by rats eating through the lead pipe, or the pipe being damaged by knocks. With regard to a set of regulations for the internal piping of houses, Birmingham had a set of rules; but that was the only town he knew of. As to the compressing plant and dust in the high-pressure main, they had found a considerable amount of dust and corrosion at Newcastle; and high-pressure mains from the works had been cleaned out and sprayed with paraffin. An examination was made after a period of four or five months, and it was found the paraffin had prevented any further formation of dust.

Mr. COPELAND (Newcastle) asked if the Tynemouth Gas Company were doing the public lighting on the new housing sites, and if so, what class of lamps they were using.

Mr. J. E. MORFETT (Sunderland) congratulated Mr. Oulds on his very able address, and said how pleased he was with the spirit of Mr. Willis' letter of welcome. That spirit could be copied with great advantage by other engineers and managers. The members of the Auxiliary Section would be encouraged, because on occasions such as these they could get an interchange of ideas and experiences, and a great store of information could be collected. In the Sunderland district they had 1500 houses under the public housing scheme. These embraced eight different schemes under seven councils In some cases they had laid the mains and services; in others the mains, services, and house pipes; and in others, the mains, services, house pipes, fittings, and gas-fires. With regard to the point raised of vibration when one main is laid, there is no reason to trouble about this in the housing schemes, as they are mostly laid out on the Garden City style, and the only traffic on the roads is tradesmen's carts. In the Sunderland district they laid single mains on two sites for houses; but when this entailed very long services, double mains were laid. This was certainly the best way. On every scheme they had been fortunate enough to get the local authority to instal gas for lighting, and had secured the street lighting in all cases. The service pipe shown in the diagram (the one adopted in Tynemouth) was far too costly. He thought the main cock in the street and the unions could be dispensed with.

Mr. A. H BAGSHAW reminded the members of the excellent papers that had been read by Mr. A. C. Hovey when at Tynemouth, and also by Mr. F. C. Willis. These previous papers had led them to expect good things from Tynemouth; and they had not been disappointed. He thought that hydrocyanic acid should be treated as an impurity, and he did not think it would be very long before every gas company would in self-defence extract this from the gas. With regard to naphthalene stoppages, they had had a considerable number of these at Sunderland; but for some time past they had been receiving considerable relief through atomizing paraffin into the gas at the rate of one gallon to every 10 tons of coal carbonized, and a steady reduction was being shown due to this method.

Mr. WELLS (Newcastle) asked if much water was found in the trap at the outlet of the meter, and if, when the main was laid in the middle of the road, a direct iron connection was made or the same arrangement adopted as when it was laid in the footpath.

Mr. OULDS, in replying, stated they had no trouble whatever with regard to electrolytic action on gas-mains in Tynemouth. The cover on the pipes laid in the footpath was 2 ft., and 2 ft. 6 in. when in the centre of the road; the service pipe passing through the grass verge. Dust had been a very difficult problem with them, and needed serious attention. He thought that corrosive action on the high-pressure mains was greatest in those of low tensile strength, and that stronger pipes were not quite so liable to gather dust. Public lighting had been secured in every case; the local authority supplying the pillars and lanterns fitted with No. 2 mantles. The chief objection they found at Tynemouth to fitting a ¾-in. bend on top of the main for the service pipe was that this part perished first, and when wiring the service, the end of the wire came through the bend instead of going into the main. This was the reason services were taken off the side of the main.

Mr. N. REID proposed a hearty vote of thanks to the Chairman for his address, which was seconded by Mr. W. BATT.

A VISIT TO THE GAS-WORKS.

The members then inspected the gas-works, after which tea was served.

Brass-Casting Research.—The British Non-Ferrous Metals Research Association, of No. 71, Temple Row, Birmingham, have carried out an extensive research on the influence of gases on high-grade brass. A further investigation is now being started by the Association at the Research Department, Woolwich, in which the support of the Engineering Co-ordinating Board of the Department of Scientific and Industrial Research has been secured. The prime object of the present work is to study the conditions necessary for securing both surface and internal soundness of strip brass ingots, such as are required for cold-rolled sheet metal. Dr. Harold Moore, O.B.E., and Mr. B. Genders, B.Met., who have already been engaged successfully on similar work, will have charge of the research, which will be conducted partly in the works of members of the Association and partly in the Woolwich laboratories.

SMOKELESS SOLID FUEL.

Prof. Armstrong again on the Warpath.

In the course of an address on "Smokeless Solid Fuel," at the annual meeting of the Manchester and Salford Sanitary Association, Prof. H. E. ARMSTRONG said his view had long been that the gas companies should lead the way, and become purveyors of both solid and gaseous fuels. Their position was most critical; they would not be able to afford to make "straight" coal gas when the price of their hard coke fell, as it must fall as soon as the low-temperature product came on the market. They would be wise if they were first in the market with this. The smokeless fuel for industrial use would be best produced at the pit-head. A beginning should be made without delay. The special value of a standardized fuel, yielding a minimum of ash, must be apparent. He was no advocate of compulsion; but if action were not soon taken, he would be prepared to join with those who would force an issue.

He referred to the following passage in the report of Lord Newton's Committee on Smoke Abatement: "The obvious conclusion to be drawn from the inquiry of the Committee is that the prevalence of smoke pollution in this country is mainly due to the indiscriminate and wasteful use of raw coal for all purposes, whether industrial or domestic, and to the lax administration of the law by the responsible authorities." It was nothing of the kind, he asserted; it was the outcome of our lax exercise of intelligence. No practical, concerted effort had been made to solve the problems of fuel. Academic inquiry into the smoke nuisance had led us nowhere, could lead us nowhere. What was needed was a practical solution; but unfortunately the Committee put forward no constructive proposals. They merely advocated measures of repression which would give the bureaucrats more power to cast stones at the user of coal—a poor, unenlightened creature whose burdens were already over-heavy.

It had yet to be proved that the nuisance which, we assumed, attached to the use of coal in our cities would be overcome when only smokeless fuels were used. Vast amounts of fine dust were produced in our cities, and propelled into the atmosphere. The extent to which they contributed to the production of gloom and made dirt, as distinct from soot, had yet to be ascertained. The chief enemy of stonework seemed to be ammonium chloride, formed from salt in the coal, and volatilized in the smoke. Plants suffered most from sulphur dioxide. The effect of this was immediate, and much worse than that due to any clogging by soot. We needed to do far more than get rid of visible smoke. Improved methods of burning would not rid us of the evils we deplored. The use of raw coal must be discontinued—but as the result of understanding, not of any dictatorial action by the State.

Quoting one of the recommendations of the Smoke Abatement Committee, Prof. Armstrong observed that it was, in plain terms, little (if at all) short of a recommendation that only gas heating appliances should be used; for until we could substitute a smokeless solid fuel for coal, gas was the only smokeless thing available at the moment. In the present uncertain state of the gas industry, such a proposal was not only premature, but preposterous. Gas had many good qualities, but also some remarkably evil ones. The time was not ripe for such restrictive legislation. We were at the beginning of a new era, and had yet to learn its possibilities. The price of gas was now prohibitive; and the appliances were miserably inefficient and costly. The industry must be completely reconstituted to place it once more upon an economic footing.

The use of coal must be rationalized, not merely to get rid of the smoke nuisance, but in order that the coal might not be wasted as it now was. The disabilities attending the use of raw coal were greatly diminished, if not entirely overcome, if coal were first washed and then subjected to carbonization at a low temperature. During and since the war he had been in closest touch with the development of the low-temperature carbonization industry, and was therefore qualified to give an opinion on the results thus far achieved. In the report of the Smoke Abatement Committee, the Barnsley process was spoken of as in the experimental stage. If this were taken to mean merely that it had not yet been adopted anywhere in practice, it was correct; but it implied very little as to the actual position. Experiments might be either successful or unsuccessful. There might be much or only little to be learned to make the process under study fit for commercial and industrial application. It might be necessary merely to establish what were the best dimensions to be given to the plant and the most favourable conditions to be observed in working practice. He believed this last to be now the proper description of the position.

Much progress had been made of late in the study of conditions which determined the combustibility of fuels. The South Metropolitan Gas Company had succeeded in producing a smokeless fuel, burning in a by no means unsatisfactory manner, from ordinary hard gas coke, by grinding it to a powder, mixing this with an equal weight of fine bituminous coal, and carbonizing the mixture at a low temperature. It had been shown that, if coal were reduced to a fine powder, then compressed under a pressure of 10 tons per sq. in. and carbonized, a coke might be produced of remarkably uniform structure, with the combustibility of charcoal. It would seem to be possible to produce smokeless fuels of any required degree of combustibility by modifying the conditions of carbonization so as to leave more or less volatile matter in the residue. The experimental plant at Barnsley had been in regular operation, with such effect that about 4000 tons had been produced of a coalite which had found a ready sale at prices above that of coal. From personal experience, he could testify to the superior value of that fuel, though that which he had had gave an undue proportion of ash, owing to the use of an unwashed coal.

The LORD MAYOR OF MANCHESTER, who presided at the meeting, commented on a paragraph in the annual report of the Manchester and Salford Sanitary Association, criticizing the Manchester Gas Committee's refusal to provide for the production of coke by low-temperature distillation at the new works at Partington. "It is affirmed by experts," added the report, "that this smokeless fuel can be produced to show a commercial profit." In reply to this, the Lord Mayor said that the Gas Committee had gone into the question very carefully. They held that what was affirmed by experts was almost invariably denied by other experts; and that it was so in this case. An affirmation by a chartered accountant would be more to the point. In the view of the Committee, the matter was still in the experimental stage; and he was certain that they would not hesitate to take it up as soon as they were sure it would show a commercial profit.

CARBONIZATION AND GASIFICATION OF PEAT.*

IN September, 1919, a Committee was appointed to inquire into the power resources of Ireland. They have just presented a report, without parallel, on peat, which is one of the most important of the exposed fuel and power resources of the country. The inquiry will later cover other forms of agents for power; but in regard to peat a great deal of scientific evidence as to its nature, calorific power, and utility has been obtained. When it is pointed out that the report extends to 110 pages, it will be realized that the Committee have not penetrated in any shallow manner into the subject. As a matter of fact, much has been written on the utilization of peat; but this is a digest of it all, with additions.

The peat resources of Ireland have an area of about 3 million acres, and are capable of yielding about 4000 million tons of air-dry turf, containing 23 p.ct. of moisture. The largest and most important of these deposits lies in the Central Plain, and has an average depth of about 18 ft. The utilization of the material in the form of the manufacture of pressed peat briquettes has failed here as well as abroad. The high percentage of water that peat contains leads the Committee to the opinion that experiments should be made with a view to determining how far the percentage of water can be reduced by bottom drainage. There is much in the report relating to such technical matters as the cutting, dredging, and spreading of the peat. In Germany automatic machines for this purpose are used on a large scale; and the Committee are of opinion that one or more should be acquired by the State, and tested carefully in Irish bogs.

Passing over much else, it is found that the carbonization of peat has been carried out in order to utilize the turf for the manufacture of (*a*) illuminating gas, and (*b*) turf charcoal. From the commercial point of view, the manufacture of illuminating gas from turf proved a failure, while that of peat charcoal proved successful. The report reviews the literature dealing with the low-temperature carbonization of peat; but the results in this direction have not been of a gratifying nature. So, turning to the section of the report on high-temperature carbonization, it is learned that the manufacture of illuminating gas from peat was carried out, many years ago, on a small scale in Co. Westmeath; and on a large scale in Paris, Uetersen, Heide, and Salsburg. The immediate object of this manufacture was the preparation, from a given weight of turf, of the maximum volume of gas, with the highest possible illuminating power. The temperature of distillation was therefore high; and the tarry products were kept as long as possible in contact with the hot walls of the retorts. Under these conditions, a ton of average turf gives about 10,000 c.ft. of gas of the following composition:

	Crude Gas. Per Cent.	Purified Gas. Per Cent.
Methane	30	42·5
Hydrogen	19	27·5
Carbon monoxide	14	20·0
Unsaturated hydrocarbons	7	9·5
Nitrogen	(trace)	0·3
Carbon dioxide	30	0·2

It will be seen from this analysis that the crude gas contains about twelve times as much carbon dioxide as crude coal gas, and that it would require something like twelve times as much lime for its purification. The percentage of carbon dioxide in the crude turf gas becomes, however, smaller when dense machine peat is substituted in the preparation for slane-cut turf. Owing to the large number of retorts found to be necessary at that time for the manufacture of turf gas, in comparison with the corresponding number for coal gas, and to the high percentage of carbon dioxide in the turf gas, the manufacture of the latter for illuminating purposes is no longer practised.

* "Report on Peat of the Commission of Inquiry into the Resources and Industries of Ireland." Price 2s. 6d. net; postage 3d. Dublin: Office of the Commission, 87, Grafton Street.

The report deals with turf charcoal and its bye-products. Into these it goes fairly extensively and yet concisely, considering how long turf charcoal has been manufactured. The general results are summarized. Taking 1000 lbs. of air-dry turf, the turf charcoal would be 350 lbs., tar 40 lbs., tar water 400 lbs., gas 210 lbs. Assuming the calorific power of the charcoal to be 12,000 B.Th.U., that of the tar 16,000 B.Th.U., and that of the gas at least sufficient to perform all the heating operations of the factory, the thermal efficiency of the process is about 70 p.ct.

Heat value of the charcoal = 0·35 × 12,000 = 4200 B.Th.U.
" " " tar . . = 0·04 × 16,000 = 640 "
4840

$$\text{Thermal efficiency} = \frac{4840 \times 100}{6800} = 71 \text{ p.ct.}$$

The charcoal, however, owing to the uses to which it can be put is much more valuable than its calorific power indicates.

As to gasification, producer gas can be obtained very cheaply from turf. It is, properly cleaned, well adapted for use in gas-engine stations, the capacity of which does not exceed a few hundred horse power. In most parts of Ireland, power, developed from turf in producer plants, would be cheaper than that got by any other method, water power excepted. The results obtained in Mr. Hamilton Robb's pioneer installation at Portadown deserve to be made widely known. The gasification of turf with recovery of ammonia will, the report states, be found an economical method of generating power in very large stations, especially in an agricultural country like Ireland, where there is a market for nitrogenous fertilizers. It is recommended that the generated gas should be employed to fire the boilers of turbo-alternators. The consumption of turf per kilowatt year is much higher than that in the direct-fired process. The capital required and the operating costs are also much higher. These disadvantages are, however, counterbalanced by the revenue from the sale of the recovered ammonia.

The most efficient method of developing power from peat is that of the producer and gas-engine. Its efficiency is, however, closely approached by that of a very large direct-fired turbo-alternator unit. Since the turbo-alternator can be constructed in very much larger units than the gas-engine, and since, moreover, it is the more reliable of the two engines, it is (the Committee hold) to be preferred for very large power stations. If the peat is poor in nitrogen, it should be fired directly in the air-dry state. If it is relatively rich in nitrogen, it may be better to gasify it with recovery of ammonia.

The average load of a peat power station in Ireland ought not to exceed 20,000 to 30,000 KW. There is no district in Ireland where both sufficient peat and sufficient circulating water to run a station of 100,000 kilowatts for a period of fifty years are locally available. A single station of this capacity would have an output of power much in excess of the prospective demand. If this power were employed to manufacture calcium cyanamide, the output of the latter would be sufficient to meet the total pre-war demands for combined nitrogen of all the fertilizer and explosive factories of Great Britain and Ireland. It is apparent, therefore, that four stations of about 20,000 kilowatts each would more than suffice for Ireland's requirements of combined nitrogen. The Committee recommend that in the near future at least one station of about 20,000 KW., fired with turf, should be erected in a suitable locality.

The report goes very deeply into this subject; and students will find the detail extremely interesting and instructive. Two among the points may be extracted. The total efficiency of a suction producer and a gas-engine, running at the maximum load, is 0·7 × 27 = 18·9 p.ct. About 2·1 lbs. of air-dry peat can, therefore, develop 1 B.H.P.-hour; and with an efficiency of 92 p.ct. in the generator, 12 tons of turf can give a KW.-year of 8760 hours. In Mr. Hamilton Robb's producer plant at Portadown, 2·55 lbs. of turf, containing 19 p.ct. of moisture, developed 1 B.H.P.-hour, excluding stand-by losses, with gas-engines running at 64 p.ct. of their rated maximum load. This corresponds to 2·75 lbs. of turf containing 25 p.ct. of moisture per H.P.-hour. A late trial of the plant showed that 3·16 lbs. of air-dry turf were required for 1 B.H.P.-hour. Allowing 3 cwt. for banking, the all-round consumption may be taken as 3·5 lbs. per B.H.P.-hour. This would be an outside figure. In view of the fact that the development of power from peat can be effected cheaply by producers and gas-engines, the Committee recommend (*inter alia*) that the use of these in the neighbourhood of bogs should be encouraged.

The report is a valuable one on account of the thorough survey it makes; and it should do much to cause the utilization of peat to become a matter of great industrial importance in and to Ireland.

The Blackburn Gas Committee are considering, in conjunction with the Park and Lamps Committee, the question of installing automatic controllers on the street-lamps.

It was reported to the Barrow Town Council meeting on Monday, the 29th ult., that at a conference between the Chairmen of the Finance, Gas and Water, and Electricity Committees, and the Borough Treasurer, Gas and Water Manager, and Electrical Engineer, it was agreed that no economies could be effected by a proposed amalgamation of the duties of the gas and water and electricity meter readers, and that no alteration be made in the system at present in force.

REGISTER OF PATENTS.

Coal Gas Purification.—No. 178,510.

ADAM, W. G., of Park Row, Knightsbridge, London.
No. 296; Jan. 4, 1921. (Patent of Addition to No. 127,431; June 21, 1918.)

This invention relates to improvements in the process for the purification of coal gas by the removal of naphthalene and any sulphur compounds contained therein, as described in specification No. 127,431.

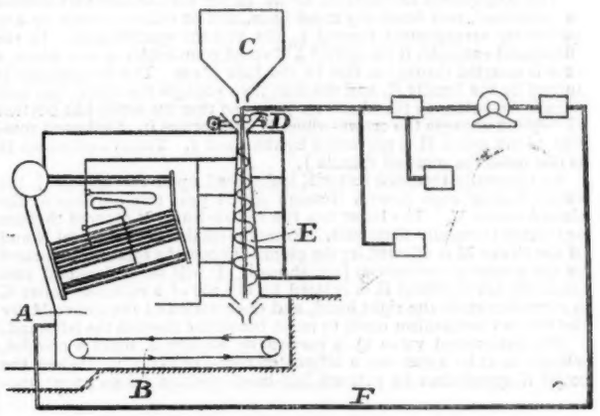
The patentee claims: To remove carbon disulphide, carbon oxysulphide, thiophene, and other organic sulphur bodies from coal gas by causing them to be observed by such a quantity of carbon in an amorphous condition prepared from carbonaceous materials other than animal or wood substances that the ethylene is not removed from the gas.

Combustion of Fuel in Furnaces, with Recovery of Bye-Products.—No. 178,952.

WILTON, T. O., of Finchley, N. 3.
No. 3407; Jan. 28, 1921.

According to this invention, the patentee utilizes the heat of the waste gases from furnaces, fire-boxes, or the like, for the extraction of the bye-products from coal or other fuel, by extracting the products before feeding in the coal. The process is characterized in that fuel is first fed forward for starting the furnace in the ordinary manner by an automatic stoker, which is extended rearwardly to a degasifying retort at the back of the boiler, with means for reversing the automatic stoker to convey degasified fuel to the furnace. In this manner use is made of the waste gases only—that is, of the gases which have parted with all their useful heat.

Referring to the accompanying drawing, the apparatus consists of the usual boiler and furnace A, with a mechanical stoker of suitable



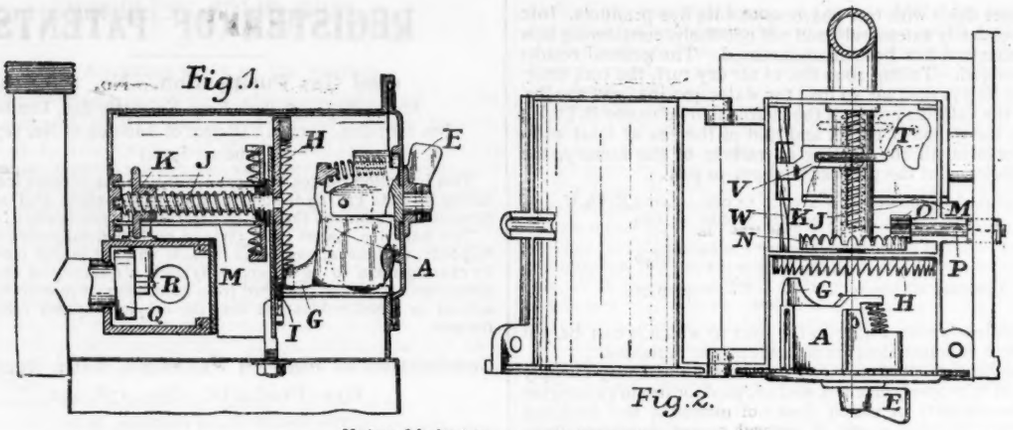
Thomas Wilton's Bye-Product Recovery Furnace.

type such as a chain stoker, adapted to be reversed, in combination with a coal feed hopper B at the back of the furnace above the smoke box C, provided with a coal breaker of a suitable known design (shown diagrammatically at D), from which the coal is led by gravitation into a vertical retort E placed within the smoke box, and discharging at its lower end on to the mechanical stoker. This vertical retort may conveniently be conical in shape, and be provided with a central perforated rotating tube provided with a helical thread for feeding the fuel gradually downwards, and with suitable known means for rotating the tube. The gases resulting from the distillation of the fuel escaping by means of the perforated tube are collected, and purified and condensed (if required), by any suitable means in the known manner, such as shown—by an arrangement of condenser and ammonia scrubber, a tar plant, and ammonia sulphate plant. If required, the waste gases may be made to pass through an exhauster and a washer before being led back to the furnace grate by piping F.

The furnace is started in the usual manner, the fuel being fed from the front. Fuel is also fed in the back hopper, and the vertical retort is filled by the operation of the helical conveyor within it. The combustion chamber is gradually raised to its normal temperature (850° to 1000° Fahr.), and the coal distils; the gaseous products escaping through the central perforated pipe. As soon as the distillation process is fairly started, the mechanical stoker is reversed, coal or fuel which has yielded its bye-products being thereby fed on at the hottest point of the grate; thereby economizing heat for the boiler. The ashes are ejected in front of the furnace and removed by any suitable means. The process is henceforth continuous and mechanical throughout.

The valuable bye-products are wholly or in part extracted before the fuel is used; and the process has for further advantage that the purified gases given off may be used for steam-raising purposes, and that smoke is eliminated.

The patentee says he is aware that it is proposed to divert furnace gases through separate ducts in order to heat a vertical retort placed side by side with a boiler, to obtain the same object as with the process and apparatus of the type described; and he makes no claim to such process and apparatus, as waste gases only are used—that is, gases issuing into the smoke box after having parted with their useful heat. He is also aware that it has been proposed to use these diverted furnace gases as above described in connection with an ordinary continuous chain-grate furnace.



Meters Limited Prepayment Mechanism.

Prepayment Mechanism.—No. 179,010.

METERS LIMITED, of Manchester, SIDES, H., of Ardwick, MORLEY, J., of Levenshulme, and MERCER, A., of Manchester.

No. 6139; July 20, 1921.

This invention relates to prepayment mechanism for gas and like meters, and has for its object to produce a neat and compact arrangement of parts for operating the gas-valve.

Fig. 1 is a sectional elevation on the line CD of fig. 2, which is a plan view of the prepayment portion of a meter with part of the casing open.

The prepayment mechanism, so far as the coin-holder part thereof is concerned, may be of any usual form, and no claim is made to any particular arrangement thereof in the present specification. In the illustrated example, it comprises a pivoted coin-holder A into which a coin is inserted through a slot in the face plate. The coin-holder is turned by the handle E, and the coin then engages the scroll cam and causes the holder to tilt about its pivot, so that the tooth-like portion G thereon engages the crown-wheel H and rotates it. Backward rotation of the wheel H is prevented by the pawl I. The crown-wheel H is fast upon the screwed spindle J.

An internally threaded collar K is disposed upon the spindle J, the collar having gaps therein through which pass two portions of the slotted sleeve M. The latter has the crown-wheel N secured thereon or formed integrally therewith. Rotation of the crown-wheel N and of the sleeve M is effected by the pinion O upon the spindle P actuated by the metering mechanism (not shown). It will be understood that when the crown-wheel H is rotated by the aid of a coin, the collar K is moved towards the right hand, and the rotation of the sleeve M by the bellows mechanism tends to move the collar towards the left hand.

The gas-control valve Q is carried by an arm R upon a spindle, which has at its upper end a bifurcated cam-like plate T. When the collar K approaches its extreme left-hand position (or its upper position in fig. 2), it engages the cam-plate and moves it to the position shown in the dotted lines, so as to close the gas-valve Q; while when the collar moves to the right (or downwards in fig. 2), it moves the cam-plate to the full-line position and opens the gas valve.

By the arrangement of the collar K, sleeve M, and spindle J, as hereinbefore described and as illustrated, it is possible to reduce the over-all dimensions of the prepayment mechanism from what are at present usual.

In order to give an indication of the amount of gas for which prepayment has been made, there is provided a forked member V, which engages the collar K so as to be traversed therewith. The member is divided at its opposite end and threads upon the rod W, which is of square or other cross section, and is twisted so as to act as a very coarse-pitched screw. At one end the rod W carries a finger which moves over a dial plate.

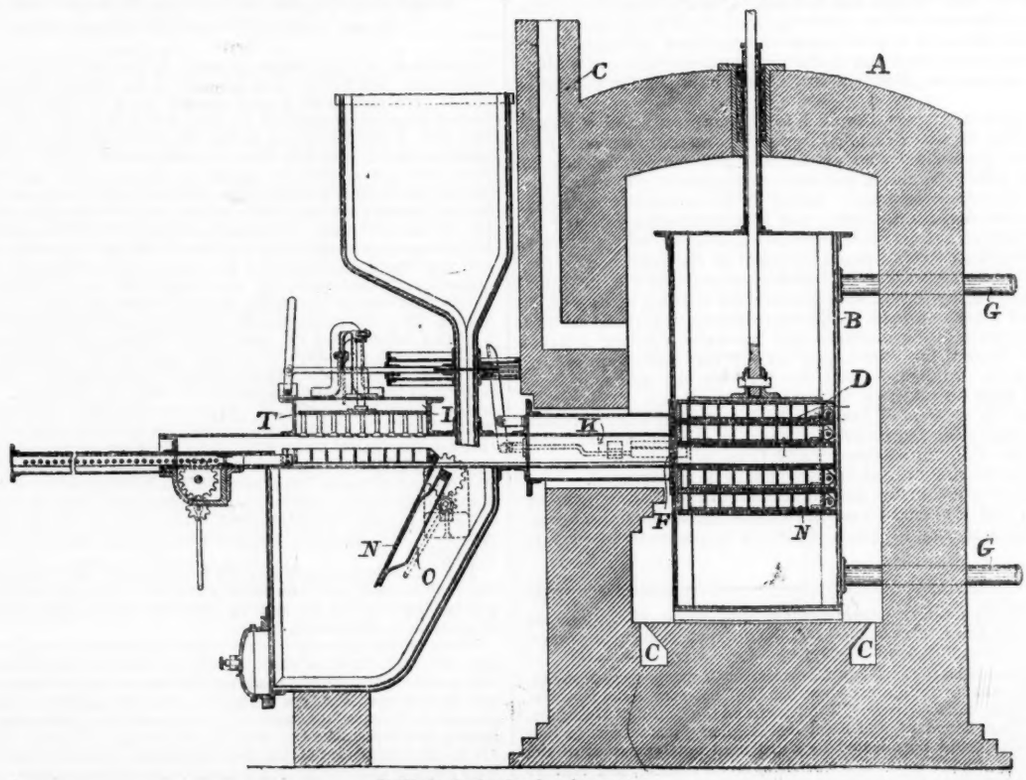
Carbonization of Coal, Shale, Peat, &c.—No. 178,994.

BEILBY, G. T., of Westminster, S.W. 1.

No. 5332; Feb. 16, 1921.

This invention relates to a method of carbonization in which the material to be carbonized is exposed in thin layers to the action of heat. The material to be carbonized is placed in shallow trays, one above another, in a cage within the retort; this cage being capable of vertical movement, so that the trays in turn may be brought opposite to an opening in the retort for removal for charging and discharging purposes. The retort containing the cage communicates by a gas-tight passage-way with a chamber outside the oven into which the trays can successively be withdrawn for charging and discharging purposes.

The illustration is a longitudinal sectional elevation of the apparatus devised for the process. The patentee employs a gas-fired oven A, of brick or similar fireproof material, having fitted within it a gas-tight



Beilby's Carbonization Apparatus.

casing or retort B, fitted with one or more exit pipes G, for the withdrawal of the volatile products of carbonization. Gas and air are introduced into the oven by way of any suitable inlets C; while the products of combustion are withdrawn through chimneys. Within the retort B is a cage D, adapted to receive one above another the trays containing the material; the cage being so mounted that it may be moved vertically to bring each of the trays in turn opposite an opening F in the retort which leads by a gas-tight passage-way to a chamber I outside the oven. In the lower side of the chamber is a hopper into which the tray is caused, by any suitable means, to discharge the carbonized material. It is preferred to employ trays having frames or partitions by which, when desired, the carbonized material may be divided up into cakes. In this case the tray may be provided with a hinged bottom N, so arranged that when the tray is pushed or pulled over the discharge opening into the hopper the bottom may be swung or slipped out of the way, so that the cakes are free to fall into the hopper. In order to effect this operation, a hinged door O is provided to control the discharge opening. On this door the hinged bottom N rests; the door being operated by a crank-handle and spur gearing.

In some cases it is necessary to assist the discharge of the carbonized material from the frames; and by way of example, such auxiliary apparatus may comprise a plate T from which depend a number of pushers spaced to correspond with the divisions of the tray. This plate is carried by two rods passing through guides on the top of the chamber I; the rods being attached to a yoke which can be raised or lowered by the operation of a lever. With certain classes of material the products can be conveniently discharged into the hopper by tipping the tray.

The means for loading the trays conveniently consists of a hopper placed above the passage leading from the retort to the discharge hopper and between the latter and the outside wall of the oven, so that each tray on its return movement passes under the discharge tube of the hopper and receives a measured charge of material; the tube being controlled by a plate slid horizontally by a rod and lever. To-and-fro horizontal movements of the trays are effected by a sliding member provided with hooks which engage corresponding hooks on the trays; the sliding member being provided with an extension and necessary gearing.

In order to ensure that the tray is in its correct position relatively to the guides in the discharge passage, before any attempt is made to move it, bolts or stops, operated by a rod K and lever, are provided in the side of the retort, which engage with suitable holes or projections in the cage. The cage is thus locked in position before the drawing mechanism is put in motion.

To counterbalance the weight of the cage and its contents, two retorts may be placed side by side in one oven; the draw-rods or their cages being connected to a chain which passes over a common pulley.

Suspending Mantles.—No. 178,958.

O'BRIEN, T. B., of Islington, N. 1.

No. 3702; Jan. 31, 1921.

This invention relates to simple and advantageous means for suspending incandescent gas-mantles of the upright type by a clip or holder of metal or other suitable material, bent to slide over the edge of the chimney. This device is provided with a hook coming at the centre of the chimney when the device is in position and holds the mantle at the correct height. The other end may be left plain, or if preferred may be bent into a ring or handle by which the device may be manipulated.

Gas Valve for Geysers.—No. 178,894.

PARKINS, T. B., of Brixton, and W. J. DAVIS ENGINEERING COMPANY, LTD., of Upper Kennington Lane, S.E. 11.

No. 172; Oct. 4, 1921.

A valve according to this invention comprises in combination two chambers clamped together by a union nut, a flexible diaphragm clamped between opposing ends of the two chambers, a double-ended spindle secured to the diaphragm and engaging at one end a ported valve disposed at one end of the water-supply pipe, and at its other end a spring-pressed valve on the end of the gas-supply pipe.

A hinged spindle is mounted in known manner in a suitable flexible diaphragm of rubber or other material, which may be reinforced by a flexible metal disc or other means. The lower end of this spindle engages with the stem of the gas valve which is normally held upon its seat by means of a spring which may be adjusted; and the upper end engages against a slidable piston or other valve mounted in the end of the water inflow pipe. This valve is so arranged that upon the water taps being turned on, the pressure of the water forces out this piston valve, thereby acting on the hinged spindle so as to cause its lower end to draw back the gas valve and permit the flow of gas to the burner. By this means it is impossible to light the gas without first turning on the water; and if the water supply should fail through any reason, the gas will be automatically cut off, so preventing damage to the geyser.

Incandescent Burners.—No. 178,895.

MOON, P. G. G., of Bournemouth, and BOYER, J. F., of Branksome.

No. 1877; Jan. 12, 1921.

In place of the regulating parts of an incandescent burner being disposed outside the hot zone, the present invention comprises gas and air regulating devices arranged in the zone of the hot gases rising from the burner, and levers connected thereto having their free ends extending beyond the zone; angular movements of the levers about independent axes serving to move the regulating devices parallel to the axis of the burner.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Chester Gas Bill: Read the third time and passed, and sent to the Commons.

Neath Corporation Bill: Brought from the Commons; read the first time; and referred to the Examiners.

Sheffield Gas Bill: Returned from the Commons, with the amendments agreed to.

Stoke-on-Trent Corporation (Gas Consolidation) Bill: Commons amendments considered, and agreed to.

HOUSE OF COMMONS.

Progress of Bills.

Chester Gas Bill: Read the first time, and referred to the Examiners.

Neath Corporation Bill: Read the third time, and passed.

Ramsgate Corporation Bill: Read a second time, and committed.

Sheffield Gas Bill: Lords amendments considered and agreed to.

Windsor Gas Bill: Reported, with amendments.

Bills Royal Assented.

The following Bills received the Royal Assent on Wednesday last: Blackburn Corporation, Sheffield Gas Company, and the Stoke-on-Trent Corporation (Gas Consolidation).

Public Utility Companies (Capital Issues) Act.

A copy was presented of a report on an application by the Cleethorpes Gas Company to the Board of Trade.

Gas Regulation Act, 1920.

In the House of Lords on Tuesday of last week, Lord Somerleyton moved that the Draft Special Orders proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act, 1920, on the application of the Aylesbury Gas Company, the Coatbridge Gas Company, the Felixstowe Gas Light Company, the Hinckley Urban District Council, the Holyhead and North Wales Gas and Water Corporation, Ltd., the Rhymney and Aber Valleys Gas and Water Company, the Sittingbourne District Gas Company, the Southport Corporation, and the Farnham Gas and Electricity Company, be approved. This was agreed to.

Gas, Water, and Electricity Charges.

Captain REGINALD TERRELL asked the Minister of Health whether his attention had been called to the continued high charges for essential services, as water, gas, and electricity, all over the country; and what, if any, steps he proposed to take to bring about a general decrease in such charges.

Sir A. MOND replied that his Department dealt only with water charges. These charges were generally limited by Statute, and he was not aware that they were generally excessive. In certain cases there was a right of application to his Department for revision, and any such application was carefully considered.

Road Tarring and Fisheries.

Major HILLS asked the Minister of Agriculture whether his attention had been directed to the preliminary report of the Committee investigating the poisonous effects of road tar, which proved that tar was highly injurious to fish, as it had been proved injurious to watercress beds; whether he was aware that the road from Hungerford to Marlborough, which runs alongside the River Kennett, with its valuable fisheries and watercress beds, was now being tarred; that a single shower of rain might do damage which it would take years to replace; and whether he would take steps to compel the road authority concerned either to stop the tarring or to use bitumen, which was known to be harmless.

Sir A. BOSCAWEN replied that he was aware of the report and of its conclusions. The effect of the report had been circulated by the Minister of Transport to all highway authorities, who were thus clearly warned as to the damage which might result to fisheries from road tarring. In regard to the second part of the question, he was informed that parts of the road in question had been, or were about to be, sprayed with tar, and that tar spraying had been carried out on this road for the last eight or nine years. With regard to the last part of the question, neither he nor, so far as he was aware, any other Minister had the power to compel highway authorities to adopt any particular form of road surfacing.

WINDSOR GAS BILL.

This Bill came before the Unopposed Committee of the House of Commons again on Tuesday of last week. It was previously before the same Committee on May 24, but was postponed in respect of the clauses relating to basic price and the raising of capital (see "JOURNAL," May 31, p. 508).

Mr. FITZALAN HOPE (Chairman of Ways and Means) was in the Chair; and the other members of the Committee on this occasion were Sir EDWIN CORNWALL, Mr. G. THORNE, and Sir ERNEST MOON, K.C. (Speaker's Counsel).

Mr. E. CAMPBELL COOPER (Parliamentary Agent) said the main points upon which the Committee had given a decision on the last occasion were with regard to the basic price and the auction clauses;

the Committee's view being that something analogous to what was put in the Swansea Bill as to price should be inserted in the Windsor Bill, and something similar to the clause in the Sheffield Bill as regards public subscriptions to capital. The new clause 10 dealt with the question of the basic price as follows:

> As from the 31st day of December, 1922, the price per therm of gas supplied to ordinary consumers: (*a*) Within the limits of the Borough of New Windsor; (*b*) beyond the said limits, shall be such as the Board of Trade may fix by Order (which Order the said Board are hereby empowered to make), and each such price shall for the purposes of this Act be deemed to be the prescribed basic price as if the same were enacted in this Act. On the coming into force of any such Order, the Windsor Gas (Charges) Order, 1922, shall cease to have effect.
>
> Provided that if at any time after the 31st day of December, 1924, it is shown to the satisfaction of the Board of Trade that the costs and charges of and incidental to the production and supply of gas have substantially altered from circumstances beyond the control of, or which could not reasonably have been avoided by, the Company, the Board may, if they think fit, on the application of the Company or of the Local Authority, make an amending Order correspondingly revising the basic price.

The date Dec. 31, 1922, was suggested by the Board of Trade; and he saw no objection to adopting it. There was a question of what would become of the Therm Order in the interval; and it was suggested that it would be better to put the Therm Order into operation. This would involve certain consequential alterations in the Bill, which he suggested could be discussed with the learned Speaker's Counsel afterwards.

The CHAIRMAN: This clause applies only to the interim period, I understand?

Mr. COOPER said the scheme upon which the Bill was framed was that it would revoke the Board of Trade Charges Order; and that Order would never be put into force. Having regard, however, to the decision of the Committee that the Board of Trade should fix the basic price, the Board thought the Charges Order should remain in force, and only be revoked in so far as it fixed the maximum price. Clause 10 was now brought up to meet the Committee's decision on the previous occasion; and it followed as closely as possible the language of the Swansea clause, with the addition of the proviso.

The CHAIRMAN said that apparently there would be two basic prices—one within the limits and one outside. He supposed there were two prices now.

Mr. COOPER said that was so. The same point arose in the Swansea case, and there was no difficulty. Continuing, he said the Committee had decided that a proviso should be added to the clause as to the period within which the revision clause was to come into force. The date Dec. 31, 1924, had been inserted; but the most recent precedents allowed a period of five years before revision. If the date mentioned was the decision of the Committee, however, he would not attempt to go behind it.

The CHAIRMAN: How many years do you want?

Mr. COOPER said it was immaterial to him, although he did not wish to be brought up in too short a period. Under the Board of Trade Order, the revision could take place any time after this Act passed; but by the clause the date would be Dec. 31, 1924. He understood this was the Committee's view. But Mr. Honey at the Board of Trade had rather expressed surprise at this period; and that was why he was raising the point now. Some of the most recent precedents were three, four, or five years.

The CHAIRMAN: We will adhere to 1924.

Mr. COOPER said the next point was with regard to the insertion of something analogous to the Sheffield clause as regards the raising of capital. In this connection he brought up the following addition to clause 14 in the Bill:

> It shall be lawful for the Company, subject to such conditions as the Board of Trade may think fit to impose, to offer the shares or stock in such additional capital for subscription by the public, and upon any such offer to pay a commission not exceeding 5 p.ct. to any person in consideration of his subscribing, or agreeing to subscribe, whether absolutely or conditionally, for any such shares or stock, or procuring, or agreeing to procure, subscriptions, whether absolute or conditional, for any such shares or stock.
>
> Provided that the payment of the commission and the amount or rate per cent. of the commission paid, or agreed to be paid, shall be disclosed in every prospectus, advertisement, or other document of the Company inviting subscriptions for such stock.
>
> Nothing in this section shall affect any power of the Company to pay brokerage.

Sir ERNEST MOON said the difference between this clause and the Sheffield one was that the words "With the consent of the Board of Trade" had been omitted from the first and second lines of the clause between the words "Company" and "Subject." This was the form in which Orders were made under the Public Utilities Companies Issues Act; and he believed it was intimated on the last occasion that perhaps it would be preferable to place a limitation on the time during which the Company should be at liberty, on the conditions which the Board of Trade thought fit, to offer shares and stock for public subscription instead of under the auction clauses.

Mr. COOPER said the words referred to as being omitted might be necessary in a case where there was some other provision for providing for the Board of Trade withholding its consent. The Public Utility Companies (Capital Issues) Act was only intended as a substitution for the auction clauses; and the Sheffield clause was in substitution of the auction clauses. In this case, there was nothing else to fall back upon if the Board of Trade withheld their consent; and he would be left in the air, as it were, and have no means of issuing his capital at all. This was why these words had been omitted.

The CHAIRMAN: The Sheffield Company have unexhausted capital powers as the result of a former Act.

Mr. COOPER: That is so.

The CHAIRMAN: Would you object to a limitation of time? You mean you could not then raise capital without coming to Parliament again, if the Board of Trade withheld their consent.

Mr. COOPER said his argument on this point was that this was such a small Company, and he had to raise £40,000 of the capital immediately; leaving very little left to issue. Moreover, most of the provincial companies, when they came to Parliament, sought powers to keep away for twelve or fifteen years. In the present case, the capital powers would run out in four or five years; and he would have to go either to the Board of Trade or Parliament.

The CHAIRMAN: It is immaterial to you whether we put in a time limit or not.

Mr. COOPER said it was immaterial in a sense; but did it serve any useful purpose?

Sir EDWIN CORNWALL: Yes; that it is necessary that promoters should know that the relaxation given by Parliament with regard to the auction clauses was in consequence of the war and the abnormal circumstances arising out of it, which to a certain extent continue at the present time. It must not be assumed, however, that Parliament will agree to doing away permanently with the auction clauses; and we have got to begin to safeguard it now. The time has not arrived to-day to do it. But in the course of the next few years I think Parliament will require promoters to reintroduce the auction clauses; and we must leave it open to Parliament to do it without giving promoters an opportunity of saying that this is a precedent. This does not mean that we want to put it upon you at the present moment. Therefore, you can have what you want, because you only want it for five years; but we have got to find a way to give you what you want and at the same time safeguard the position.

The CHAIRMAN said it was simply not to create a mischievous precedent; and the Committee would give three years from the passing of the Act for the operation of this addition to clause 14.

Mr. COOPER: Is it to be subject to the Board of Trade in that time?

The CHAIRMAN: No, I think it should read something like this: "It shall be lawful for the Company, at any time within three years from the passing of this Act, and subject to such conditions as the Board of Trade may think fit to impose, to offer shares or stock . . ."

Mr. COOPER asked how he was to raise his capital if he did not raise it all in three years.

The CHAIRMAN said the auction clauses could be put in to provide for that, and in the meantime there would be this clause to fall back upon.

Mr. COOPER said what was troubling him was that the Committee were practically putting the auction clauses upon him after three years without regard to what the conditions might be at that time.

The CHAIRMAN: No doubt we are; but we mean to unless you can show cause to the contrary. That is our object, from the point of view of precedent.

Mr. COOPER pointed out that there was no limitation in the Sheffield case.

The CHAIRMAN: Would it help you if the Board of Trade have power to extend the three years?

Mr. COOPER: Yes, if you will give me that.

Sir ERNEST MOON: And you must put the auction clauses in, too, so that the Board of Trade would not be forced to extend the time.

The CHAIRMAN: If you were in a tight place again, the Board of Trade would help you through. Subject to your bringing up these amendments for the satisfaction of Sir Ernest Moon and myself, we will report the Bill for third reading.

The preamble was then formally proved by the Secretary of the Company.

The main objects of the Bill are to empower the Windsor Royal Gaslight Company to sell on a heat-unit basis, to make new provisions as to the charges for gas and the application of the profits of the Company, to raise further capital, and extend the limits of supply. The basic price proposed in the Bill, now to be settled by the Board of Trade, was 16d. per therm within the borough of Windsor and 17d. per therm (in the original Bill it was 19d.) beyond the borough. Under clause 11 of the Bill, a dividend of 10 p.ct. may be paid on the original shares of the Company and 7 p.ct. on the new capital. The new capital powers are £30,000, with borrowing powers to the extent of one-half of the paid-up capital for the time being. Power is also taken to issue redeemable debentures. There are also a number of general clauses, and power to acquire additional land for the manufacture and storage of gas and residual products. A clause has been inserted providing that whenever there is a change in the calorific value of the gas supplied, the cost of adjusting or replacing the apparatus of the London and South-Western Railway Company shall be borne by the Gas Company. A number of small amendments will have to be made before the Bill is finally reported; but these will be placed before the Speaker's Counsel.

Peerless Light Company.—Among recent registrations is that of the Peerless Light Company, with a capital of £500, to conduct business as manufacturers of incandescent gas-mantles and other illuminating devices and appliances. The Solicitors are Messrs. H. Crafter & Co, No. 7, Southampton Street, Bloomsbury Square, W.C.

Providing for a Deficiency at Llandudno.—In introducing the financial requirements for the year 1922-23 to the Llandudno Urban District Council, Mr. William Symonds (the Chairman of the Finance Committee) called attention to the fact that the Committee were making provision for a deficiency on the gas account of £8000. He remarked that in the past criticism had been mainly directed against the gas concern. They did not mind genuine and fair criticism; but when he looked round the table, and noted that not more than one-third of the present members were members in 1914, he thought they could honestly claim to be as free from blame as their critics for any error of judgment with reference to the gas undertaking. The dilapidated state of the works was their inheritance from their predecessors; and he contended that they had done the best thing in bringing the gas-works up to date, and assuring a supply for the future.

MISCELLANEOUS NEWS.

GAS REGULATION ACT ORDERS.

There have been received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Annfield Plain and District Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 18·6d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five.

Prepayment meter clauses are included. (May 30.)

Busby and District Gas Company, Ltd.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 20d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five-and-three-fifths.

Prepayment meter clauses are included. (May 25)

Matlock and District Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 14·6d. per therm.

After the declared date, "1·2d. per therm" shall be substituted for "6d. per 1000 c.ft." in section 70 (as to price of gas in Whinster) of the Matlock and District Gas Act, 1904.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-four fifths.

Prepayment meter clauses are included. (May 30.)

New Hedon Gas and Coke Company, Ltd.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 19·4d. per therm; and this price shall be substituted for the price of 4s. 6d. per 1000 c.ft. wherever it occurs in section 26 (price of gas) of the Hedon and District Gas Order, 1904.

After the declared date, "per therm" shall be substituted for "per 1000 c.ft." and the words "fifth of a penny" shall be substituted for the word "penny" wherever occurring in paragraph (2) of schedule B to the Hedon and District Gas Order, 1904. (May 30.)

Rugeley Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half.

Prepayment meter clauses are included. (May 30.)

Tynemouth Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 12·6d. per therm; and this price shall be substituted for the price of 3s. per 1000 c.ft. mentioned in section 30 (altering maximum price of gas) of the Tynemouth Gas Act, 1904.

After the declared date, 1·2d. per therm and 2·4d. per therm shall be substituted for 6d. per 1000 c.ft. and 1s. per 1000 c.ft. respectively in section 9 (price of gas in added area) of the Tynemouth Gas Act, 1913.

Prepayment meter clauses are included. (May 29.)

DECLARATIONS OF CALORIFIC POWER.

Basingstoke Gas Company.—500 B.Th.U. (July 1.)

Crediton Gas Company.—500 B.Th.U. (June 30.)

Ely Gas and Electricity Company.—500 B.Th.U. (June 30.)

Llantrisant and District Gas Company.—500 B.Th.U. (June 30.)

Newport (Isle of Wight) Gas Company.—500 B.Th.U. (June 12.)

Runcorn Gas Company.—500 B.Th.U., in place of 480 B.Th.U. (Oct. 1.)

Shotley Bridge and Consett District Gas Company.—500 B.Th.U. (June 15.)

Twyford (Berks.) Consumers' Gas Company.—475 B.Th.U. (June 24.)

Wandsworth Company's Further Reduction.—The Directors of the Wandsworth, Wimbledon, and Epsom District Gas Company notify consumers that the price of gas will be further reduced over the whole area of supply by a second 1d. per therm beyond the 1d. previously announced. These together amount approximately to 9½d. per 1000 c.ft. This reduction will take place from the taking of the meter indices at the Midsummer quarter.

Finances at Leek.—The Leek Urban District Council have congratulated the Gas Engineer (Mr. R. H. Ginman) upon the successful working of the undertaking during the past year, when profits were made amounting to £4678. The price of gas has been reduced to the following figures: In the Leek area, ordinary consumers 4s. 6d. per 1000 c.ft., less the present discounts; slot-meter consumers, where they own their own fittings 15 c.ft. for 1d., less 20 p.ct. discount, and where Council fittings are used 14 c.ft. for 1d., less 20 p.ct. discount. In the Rudyard area, ordinary consumers 5s. 6d. per 1000 c.ft., less 6d. per 1000 c.ft. discount; slot consumers, with own fittings 15 c.ft. per 1d., less 10 p.ct. discount, with Council fittings 15 c.ft. for 1d. without discount. The Gas Engineer said he took over the works in June, 1913; and in that year the calorific value was 500 to 600 B.Th.U. Now it was from 450 to 480 B.Th.U.

GAS BORROWING POWERS IN BIRMINGHAM.

An application by the Birmingham City Council for sanction to borrow the sums of £347,655 and £54,000 for the purposes of the gas undertaking was heard in the Council Chamber last Wednesday, by Mr. William Cross, an Inspector of the Ministry of Health.

Dealing with the larger amount first, the Town Clerk (Mr. F. H. C. Wiltshire) explained that the money was needed to enable the Corporation to provide increased storage capacity for gas. One of the usual practices in the gas industry was that the amount of storage capacity should equal at least the maximum consumption of one day's output. The existing storage capacity was nearly 36 million c.ft., whereas during the past winter the maximum consumption was approximately 45 million c.ft. In the previous winter it was 51 millions; and in the winter of 1918 it reached the high figure of 56 million c.ft. It would be seen, therefore, that the present storage capacity was quite insufficient. Moreover, two existing holders at the Nechells works, with a total capacity of 12 million c.ft., were in a bad state, and would probably in a short time require considerable repair. The city purchased land at Washwood Heath in 1911, and received power in 1912 to utilize it for the purpose of the gas undertaking; and no doubt but for the war the matter would have been proceeded with some time ago. The department felt they had been working under grave risk, and that the time had arrived when matters should be adjusted.

Evidence in support of the application was given by Alderman J. H. Lloyd (Chairman of the Gas Committee) and Mr. J. Foster (Engineer-in-Chief). The latter said the new holders would provide capacity for an additional 9 million c.ft. The output now averaged 50 million c.ft. per day. The department was doing as little as it could, owing to the financial position. Additional works would be necessary when things got more easy. The new works would take two years to construct; and the department was anxious to get on with the work as soon as possible.

The Town Clerk then explained that the loan of £54,000 was needed in connection with the laying down of a new distributing main in the Erdington and Sutton Coldfield district. The necessity for the work was evident when it was realized that the demand for gas in this area had increased to the extent of 72½ p.ct. in ten years; so that the existing main, which in 1910-11 carried 325 million c.ft. was last year called upon to carry 561 million c.ft. The result was that the pressure had been diminishing for several years, and was not at all satisfactory.

Mr. J. Hewett (Distributing Engineer) having given evidence, the inquiry closed.

PRICE OF GAS IN BIRMINGHAM.

Discussion in the City Council.

One of the items on the agenda for last week's meeting of the Birmingham City Council was a report of the Gas Committee [*ante*, p. 515] which dealt in some detail with the question of the charges for gas, and also with the annual accounts.

Alderman LLOYD, in moving the adoption of the report, said the method adopted in 1915, after considerable thought and care, was that the same price was charged for each lot of gas for lighting and cooking and domestic purposes. The table of percentage increases showed that no injustice was done to the lighting consumer. The lowest percentage increase which anyone had to pay was 125 p.ct. During the war the prices for large consumers were increased more rapidly than for small consumers; and this required equitable adjustment as prices fell. The reason why there were lower rates for power and industrial heating was owing to the great advantage of the regular day load, and on account of competition from electricity, producer gas, and oil. If the gas used for manufacturing purposes was sold at the same price as to the ordinary small consumer for lighting purposes, it would only enable a reduction of 1¾d. per 1000 c.ft. to be made in the price to small consumers, if the whole of the manufacturing load could be retained; but if the whole manufacturing load were lost the standard charges would advance, with the result that, instead of a reduction, there would be an increase of 7d. per 1000 c.ft. to the remaining consumers.

Mr. ALDERSON asked if the Committee could arrange in the case of renewals and new houses to instal shilling slot-meters, as there was a difficulty in securing pennies in working-class districts. [Laughter.] This, at any rate, was the complaint made to him.

Alderman STEVENS moved an amendment: "That the report be referred back, and the Committee instructed to supply to the Council the cost of gas into the holder for each parcel supplied, and also of distribution for each parcel; and that for the June reading of the meters the same price be charged for each parcel of gas irrespective of the purpose for which the consumer might use it." He described the report as unconvincing, and pointed out that in 1915 the difference between the highest and the lowest charge was 4d. per 1000 c.ft., whereas now the difference was 1s. 6d. In 1875, the difference between the highest and the lowest was 6d.; and those who had read the history with regard to gas in Birmingham would know that there were then two undertakings and two sets of mains. The industrial classes wanted manufacturers and consumers to pay the same. At the present time the manufacturers were subsidized by having cheaper gas; and there was no justification for this. The small consumers—those who were least able to bear the burden of gas production—were being robbed. It was contended by the Committee that they were giving a preferential rate to the manufacturers because they carried the day load. The Committee had not looked into the matter, otherwise they would not have made a statement of this kind. The figures showed that from lighting and domestic purposes the revenue was £1 902,214, while the revenue from manufacture and motive power was £568,975. He did not think there could be greater proof that the domestic services were the great stand-by of the Gas Department. The reduction of 12½ p.ct. in the output of gas over the last twelve months was not

due to a question of charges, but to the trade depression. Birmingham possessed one of the best-equipped undertakings in the country; and he wanted the best possible results.

Mr. AGER seconded. He said it was not a fair proposition that the large manufacturers should have gas supplied at a loss to the Corporation, and the difference be made up at the expense of the lighting consumer. It had been said that one of the reasons for giving a preference to the manufacturers was in order to help to build-up the trade of Birmingham, and provide employment. This, however, had not operated in the past. He did not think that would bring about a revival in trade. If it was necessary to subsidize employers during the present period of depression, it was equally necessary to subsidize the men who had nothing to live upon.

Mr. CLUTTERBUCK asked why the costs of the Gas Department had increased, though the demand for gas was not so great.

Alderman WILLIAMS said Alderman Stevens would never agree to figures unless they suited his argument. If the day load was abandoned, 7d. would be added to the price of gas. The profit made during the year was £20,000; and it was only a question of decimal points that had produced this result.

Alderman LLOYD, in reply to Mr. Alderson, said shilling slot-meters were being placed in the better houses. As prices came down, penny slot-meters would be more wanted. With regard to Mr. Clutterbuck's question, the cost of administration would be reduced in the current year. Dealing with Alderman Stevens's criticism, Alderman Lloyd said it was in the public interest that a lower price for gas should be charged to the large consumers. He was satisfied no user was getting gas below cost price. Mr. Ager seemed to think they were not helping to build-up trade by supplying the large consumers. He (Alderman Lloyd) maintained they were. The department had passed through a difficult year, in view of the industrial disputes; and he did not think the Council fully realized how much they were indebted to the Engineers and staff.

The amendment was defeated by 62 votes to 24 votes; and the Committee's report was adopted.

ST. HELENS GAS-WORKS RESULTS.

From the statement of working results of the St. Helens Corporation Gas-Works for the year ended March 31 last, it appears that during this period (which, of course, embraced the national coal stoppage) there were carbonized 40,344 tons of coal, as compared with 42 981 tons in the preceding year. The quantity of gas made was 538,242,000 c.ft.—11,293,400 c.ft., or 2·05 p.ct., less. This reduction in output was caused chiefly through the restriction of the gas supply during the first three months of the year. From the coal carbonized there was made for sale 18,694 tons of coke and breeze, 441 tons of sulphate of ammonia, 203,862 gallons of tar oils, and 1136 tons of pitch.

Coal cost 34s. 4d. per ton, as compared with 35s. 6d. during the preceding year; and owing to the fall in market values, residuals realized £13,000 less. The total amount of wages paid during the year was £36,666, as against £41,826 in the preceding year. The gas-rental produced £108,254, or 4s. 4·39d. per 1000 c.ft., as compared with an average price of 3s. 11·24d. for the year before. The gross profit was £20,491; and after paying interest and sinking fund charges and revenue contributions to capital account, there was a net profit of £6227. For the previous year there was a deficit of £6941.

There are in use 20,604 consumers' meters (including 17,434 coin-meters), and over 19,000 gas appliances of all sorts.

ROTHERHAM CORPORATION GAS DEPARTMENT.

In his report to the Gas Committee of the Rotherham Corporation on the working of the undertaking for the year ended March 31, Mr. J. S. Naylor (the Gas Engineer and General Manager) states that the quantity of coal carbonized during the year was 17,545 tons, at a cost of £30,472, or 35s. per ton, as against 18,307 in the previous year, costing £30,509, or 33s. 4d. per ton, being a decrease of 762 tons, and an increase of £233 respectively. The gas made was 230,483,000 c.ft., as against 248,065,000 c.ft., being a decrease of 17,582,000 c.ft. This is accounted for by the increased supply of coke-oven gas from Messrs. J. Brown & Co., Ltd., Canklow. The quantity purchased in the past year was 88,409,000 c.ft., as against 74,270,000 c.ft., an increase of 14,139,000 c.ft. The gas made per ton of coal carbonized was 13,136 c.ft., as against 13,550 c.ft., being a decrease of 414 c.ft. per ton. The quantity of gas sold was 290,218,000 c.ft., as against 291,252,000 c.ft., a decrease of 1,034,000 c ft. The unaccounted-for gas was 7·74 p.ct. of the make, as against 8·31 p.ct.

The cost of public lighting in the borough, including wages and maintenance of lamps, amounted to £8401, as against £7038, being an increase of £1363. The cost of gas for public lighting was £3313, as against £3256, being a decrease of £57. The balance owing to the bank on March 31 was £13,055, as against £5038 a year ago. The amount of gross profit made was £13,580, as compared with £19,588. The net profit, after allowing for interest, redemption instalments, and contributions to sinking funds, amounts to £2009, as against £8588 for the previous year.

Another Reduction in Price at Exeter.—The Directors of the Exeter Gas Light and Coke Company give notice that the general price of gas will be reduced from 10·8d. to 9·8d. per therm (which is equivalent to a further reduction of 4¾d. per 1000 c.ft.) as from the taking of the indices at Midsummer. The quantity of gas per penny supplied through the slot-meters will be adjusted at the same time. The price was reduced from 11·8d. per therm at Christmas last. The total of the two reductions represents a saving to the gas consumers of £20,000 per annum.

GAS FOR GENERATING ELECTRICITY.

It was claimed at a gathering of members of the Buxton Corporation at the municipal electricity works last Saturday fortnight, that the introduction of a gas plant for the generation of electricity, in place of steam, had been the means of transforming the undertaking from a losing to a profit-making concern.

The occasion was the inauguration by the Mayor (Alderman A. W. Wall) of an entirely new system, completed under a scheme of 1920, which replaced the existing steam plant with gas-engine driven generators. The change, which has taken two years to carry out, has been in the capable hands of Messrs Browett, Lindley, & Co., Ltd., who were represented by Mr. J. Hulme, the Works Manager. The Buxton Gas Engineer (Mr. F. G. Shaw) was heartily thanked for the assistance he had given in making the gas generating scheme a success. The Chairman of the Electricity Committee (Mr. Sanders) mentioned that, as a result of the introduction of gas in place of steam for the generation of current, the electricity undertaking was paying its way; and he intimated that the prospects of the town getting cheaper current in the near future were now exceedingly rosy. In 1920 they lost £3378. Then the Committee commenced to put in the new gas plant, which would cost altogether over £21,000; and from that time there came a change in the financial position of the electricity concern.

Mr. Shaw mentioned that in 1919 the electricity works used 2788 tons of coal for steam-raising. To generate the same amount of electricity by gas-driven plant, the gas from 1300 tons of coal only would be required. This coal, when carbonized at the gas-works, yielded 650 tons of coke and 50 tons of tar; so that the net destruction of fuel with the new gas plant was only 600 tons per annum, against 2788 tons under the steam system.

BRIGHOUSE GAS-WORKS ACCOUNTS.

In his report to the Brighouse Corporation Gas Committee on the working for the year ended March 31, Mr. C. W. Ward (the Engineer and Manager) says that the quantity of gas sent out during the twelve months was 158,990,000 c.ft., which was 3,460,000 c.ft. less than in the preceding year. Obviously, had trade been normal, the output would have exceeded that of the previous year. The total quantity of gas sold was 155,653,825 c.ft., leaving 2·1 p.ct. of the make unaccounted for. This, he remarks, is very satisfactory, and will rank among the lowest percentages in the country. The average consumption per slot-meter during the year was 16,717 c.ft., as compared with 15,176 c.ft. in the previous year.

The average make of gas per ton of coal carbonized was 11,607 c.ft. The year before the make was 11,129 c.ft. The increased make was largely due to the better coal carbonized. Residuals yielded 61·14 p.ct. of the total cost of coal; whereas 85 p.ct. of the cost was realized in the preceding year. The average cost of coal per ton was 3s. 1·35d. less; and after deducting net revenue from residuals, the net cost of coal was 14s. 7·22d. per ton. The wages bill amounted to £11,565, being £1393 less. The average price received per 1000 c.ft. of gas sold was 4s. 5·55d.

The year's working resulted in a gross profit of £5544, and a net profit of £891. Referring to this, Mr. Ward says: "When the financial result is considered in the light of the conditions which prevailed during the year, and the moderate price of gas charged is taken into account, I feel that the position at the year-end is very satisfactory."

The Committee are recommending to the Council that the price of gas from April 1 should be 3s. 6d. net to ordinary consumers; the discounts off gas used for industrial purposes and public lighting to be as hitherto.

Reduction in Price at Thornton.—It was stated at the last meeting of the Thornton District Council that the coal strike had necessitated an increase in the price of gas to the extent of 1s. per 1000 c.ft. as from August 1 last. The year showed the small profit of £41. The Committee thought they were on the safe side in lowering the price of gas to 5s. per 1000 c.ft., a reduction of 1s. 6d. They could do this without running any risk of a deficiency during the current year.

Leicester Gas Price Again Reduced.—A further reduction in the price of gas has been made in Leicester. At Christmas last there was a concession of 6d. per 1000 c.ft.: and the proposals now ratified by the City Council mean that the price to ordinary consumers is reduced by 10d. and to power consumers by 1s. 2d. per 1000 c.ft. In moving the adoption of the report at the meeting of the City Council, Mr. G. E. Hilton said they hoped the reasons for the reductions would continue, and that in the near future they would be able to make further proposals. There was considerable criticism of the fact that the power consumers were getting gas at a much cheaper rate than the ordinary consumers. The new price to the former is 3s., and to the latter 3s. 9d. One member said he understood that the cost of production to-day, without maintenance charges, was 3s. 9½d. per 1000 c.ft.

Bridlington Gas Company's Special Order.—At a meeting of the Parliamentary Committee of the Bridlington Corporation, the Town Clerk submitted and explained a Draft Special Order proposed to be made by the Board of Trade under the Gas Regulation Act for the Bridlington Gas Company, which provides for an extension of the limits of supply so as to include the parishes of Bessingby, Flamborough, and Sewerby-cum-Marton, authorizes the use of additional land in the borough for gas-works purposes, the raising of additional capital and the exercise of further borrowing powers, a scheme for profit-sharing, the supply of power gas, &c. The Committee carefully considered the Order; and as in their opinion it required amendment for the protection of the borough, it was resolved that the Chairman, Town Clerk, and Borough Surveyor be requested to interview representatives of the Gas Company, in order to ascertain whether they would be prepared to amend the Order to meet the views of the Committee, and that in the event of the Company not being prepared to do so, they be authorized to take all such steps as they may consider advisable.

PATENT OFFICE REPORT.

There was issued last week, over the signature of Mr. W. Temple Franks (the Comptroller-General) the thirty-ninth patents, designs, and trade marks report, dealing with the year 1921, which shows that the number of applications for patents received during that period was 35,132. This is a slight falling-off when compared with the record figure (36,672) of the previous year, but it is substantially more than the number received in any pre-war year. The number for 1919 was 32,853. The patents sealed numbered 12,301 in 1919, 14,191 in 1920, and 17,697 in 1921. The complete specifications filed last year were 19,159, or 2637 less than in 1920. This decrease was almost wholly in the number of complete specifications filed on application, due to the expiry on Jan. 10 of the extensions of time granted by the Treaty of Peace with Germany and the Berne Agreement of June 30, 1920, for the filing of applications under the Convention.

The receipts from patents fees during the year were £445,947, which amount is £25,475 more than in 1920. The total receipts of the department were £525,500, as compared with £487,542 in 1920. This is an increase of £37,958, and is the largest amount ever received in any one year. There was a surplus of receipts over expenditure of £73,588. The sum received from patents renewal fees again increased; the figures being £303,823, as against £286,498 in the previous year.

Under section 2 of the Act of 1919, there were received last year 594 requests for indorsement of patents. One application for settlement of terms of licence was received, the proceedings on which have been suspended at the request of the parties. The number of applications made for the restoration of patents which had lapsed in consequence of the non-payment of renewal fees was 106. There were 29 applications under the provisions which empower the Comptroller to revoke a patent upon request made within two years from the date of the patent by any person who would have been entitled to oppose its grant. There were three offers to surrender patents; and orders revoking them were duly made. For the grant of a compulsory licence, three applications were lodged, covering seven patents. The number of hearings upon oppositions to the grant of patents was 35, as compared with 43 in 1920. Under section 18 of the Acts, two petitions for extension of term were lodged, covering three patents. In one case each of the two patents in question were extended for four years; while in the second instance an extension of four-and-a-half years was granted. Nine applications by originating summons for extension of term were also made; these covering 27 patents. Of the seven cases involving fifteen patents dealt with, eight patents have been extended by periods varying from three to four-and-a-half years; extension of the term of two patents has been refused; applications in respect of four patents have been withdrawn or abandoned; and with regard to the remaining patent, the application has been ordered to stand over. There are now 22 patents in force which have been prolonged beyond the normal period.

The names of seven patent agents were added to the register during the year, making the total number on the register at the end of December 307.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 31.]

Nos. 14,332 to 14,994.

AGOSTINI, P.—"Distributing-valves, &c." No. 14,510.
BARRACLOUGH, A.—"Gas-cookers." No. 14,446.
BIRKNER, M.—"Fire-grate combined with gas-generator." No. 14,783.
BURN, L.—"Gas-producers." No. 14,759.
COKE AND GAS OVENS, LTD.—"Apparatus for debydrating tar." No. 14,407.
COKE AND GAS OVENS, LTD.—"Apparatus for production of neutral ammonia sulphate." No. 14,408.
CRAIG, G.—"Apparatus for cleaning coke-fed blast-furnace gas, &c." No. 14,714.
DANKS, A.—"Retorts for recovery of bye-products from coal and oil shale, &c., and for cracking oils." No. 14,802.
FORRESTER, C. J.—"Fittings or mountings for incandescent gas-burners." No. 14,474.
HADWEN, H. E.—"Gripping-appliance for anti-vibrating devices for flexible gas-tubes, &c." No. 14,348.
HAMMOND, F. W.—"Removing scale and deposit from interior of piping." No. 14,725.
HEALY, J.—"Vaporizer for suction-gas producers." No. 14,448.
IONIDES, A. G.—"Support for incandescent mantles." No. 14,451.
JOHNSON, J. Y.—"Apparatus for feeding fuel into gas-producers, &c." No. 14,524.
JOHNSON, P. G.—"Pipe-joints." No. 14,628.
LAING, B.—"Distillation of carbonaceous, &c., materials." No. 14,784.
MERCER, H. L.—"Gas-heated wash-boilers." No. 14,688.
MESCHINI, A.—"Gas-carburettors." No. 14,742.
MILL, A. G.—"Gas or electric-heating apparatus convertible into cooking apparatus." No. 14,442.
MOORE, J. W.—See Meschini, A. No. 14,742.
NIELSEN, H.—See Laing, B. No. 14,784.
ORME, F.—"Apparatus for compressing, fanning, or pumping gases and liquids." No. 14,347.
PARKINSON STOVE COMPANY, LTD.—"Radiators." No. 14,437.
REMUND, P.—See Meschini, A. No. 14,742.
STILL, C.—See Coke and Gas Ovens, Ltd. Nos. 14,407, 14,408.
VICTORY PIPE JOINT COMPANY, LTD.—See Johnson, P. G. No. 14,628.
WILLIS, H.—See Hadwen, H. E. No. 14,348.
WOOD, W.—See Johnson, J. Y. No. 14,524.

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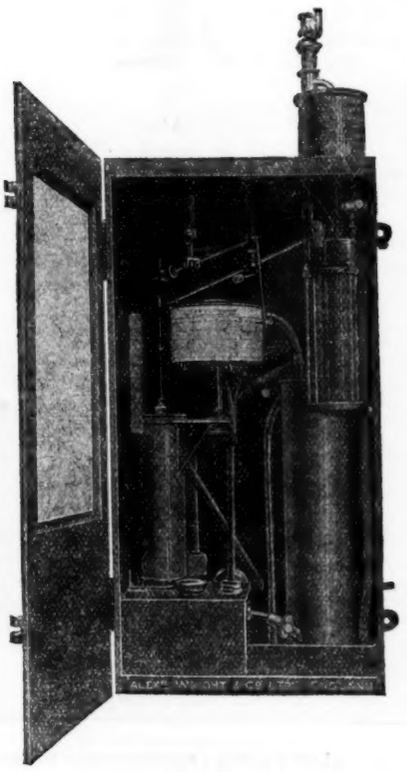

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *June* 6.

Owing to the holiday, there has been practically no business during the last few days; but pitch and creosote remain in a firm position. Shipments of pitch for the season are nearly finished.

Farmers are still taking small quantities of sulphate of ammonia.

Tar Products in the Provinces.

June 6.

The average values for gas-works products during last week were: Gas-works coal tar, 35s 6d. to 40s. 6d. Pitch, East Coast, 67s. 6d. to 70s. f.o.b. West Coast—Manchester, 65s. to 67s. 6d.; Liverpool, 65s. to 67s. 6d.; Clyde, 67s. 6d. to 68s. 6d. Benzole 90 p.ct. North, 2s. 1d. to 2s. 2d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 1d. to 2s. 2d. Toluole, naked, North, 2s. 2d. to 2s. 5d. nominal. Coal tar crude naphtha in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 1d. to 2s. 3d. Creosote, in bulk, North, liquid, 4⅛d. to 4⅜d.; salty, 4¼d. to 4⅜d. Scotland, 4d. to 4⅛d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.ct., 2s. to 2s. 1d. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

Manchester District Tar Prices.

The average price realized for the sale of tar for the month of April, according to the sliding-scale, was £2 8s. 5·91d. per ton.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

There is very little fresh to report in connection with these markets. There is, however, some inquiry for pitch for prompt shipment; but deliveries are matters of difficulty in view of the hot weather. No great interest is shown in forward buying as yet. South Wales buyers, however, are more active, although there is not much change in quotations, which remain in the neighbourhood of 67s. 6d. to 72s. 6d., according to position. Creosote keeps firm, and there is some prospect of an improved demand very shortly on account of increased imports of timber from the Baltic. There is a fair demand for tar for road repairing purposes. This work has been going forward in fair quantity of late. Solvent naphtha is still quiet, and only small lots are purchased, and then immediate delivery is required, so that it would seem that buyers have not much in reserve, and are looking for prices possibly to fall further. There is no change in carbolic acid; but cresylic acid is fairly well bought for immediate delivery. Further than this, some speculative buying for delivery during the next three months has been going on. Pale 97-99 p.ct. is quoted about 2s. 4d., and dark 95-97 p.ct. is about 2s. 1d. There is no change in naphthalenes. In intermediate products, there is rather a better trade, with increased interest both on home and export account.

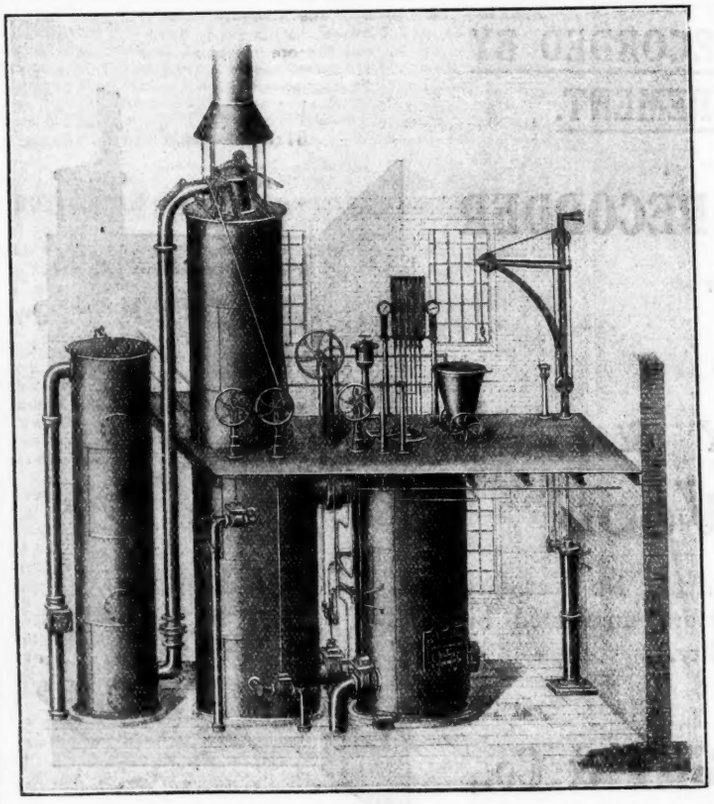
Sulphate of Ammonia.

There is practically no change in the position, and little business has been done. The official price for May is to continue as the price for June; and although no announcement has yet been made by the Federation as to prices for deliveries July, August, and onwards, it is understood that these prices have been agreed upon, and that, when published, it will be found that quotations for early deliveries are well below the price for May and June of this year, and rather dearer than for the early deliveries of last year. The export position is easier at the moment, and there are now fair quantities on offer. Prices for the export trade in future, however, are likely to be more in keeping with those for Chilean nitrate, of which further large quantities are available at much lower prices than was recently the case.

Silsden Gas-Works Loss.—It was reported to the Silsden District Council last week that there was a loss of £762 on the gas-works for the past year, attributed to the extra cost involved in maintaining the output during the coal stoppage. The Chairman of the Committee (Mr. H. Wilson) said there was no prospect of a reduction in the price of gas during the present year, as it would take them all their time to wipe-off the deficit.

Price of Gas at Spenborough.—The Spenborough District Council last week decided to reduce gas-meter rents as from July 1. A complaint was received from a power customer in regard to the price charged for power gas; and it was agreed that the question of the price of gas generally be referred to a Special Sub-Committee to consider and report. The Chairman of the Gas Committee remarked that the Committee were fully alive to the situation; and it was hoped some satisfactory result would be reached by the Sub-Committee.

Misapplication of Union Funds.—At the Birmingham Police Court last Wednesday, Henry George Finch, described as late Secretary of the Redditch Gas Workers' Branch of the National Union of General Workers, appeared on a summons charged with wilfully withholding the sum of £60 6s. belonging to the Union, and misapplying it. Defendant pleaded guilty. Mr. Willison, who prosecuted, stated that by means of wrong returns, and by reporting that men were behind in their contributions, Finch appropriated to himself the sum named. He had written acknowledging the offence, and expressing a desire to pay it back. In the circumstances, the prosecution did not press for Finch to be sent to prison. Mr. Parrish, for the defendant, said his client was a married man with five children; and there had been a great deal of sickness, involving heavy expense, at home. The Stipendiary fined Finch 40s., and ordered him to repay the £60 6s.



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STOCK MARKET REPORT.

BUSINESS on the Stock Exchange last week was on a reduced scale, and the tone for the most part dull. The condition of affairs in Ireland was chiefly responsible for this; while the slacking-down was influenced by the approaching Whitsuntide holiday.

The gilt-edged market was not strong, and Home Government issues gave way. Friday's figures for the big four were: Consols 56¼-57⅛, War Loan 99⅜-99 11/16, Funding 86 86⅛, Victory 89 1/16-89⅜. Home Rails were pushed up smartly; but an attack of profit-snatching corrected this.

The Foreign Market showed a good front for a while, but weakened before the close.

Business in the Gas Market continued fully as quiet as it had been the week before, and a noticeable feature was the increased number of undertakings in which there were no transactions at all. However, the strength of the market remained unimpaired, and several advances in quotation were the result. In the London Companies, Gas Light ordinary and Commercial 4 p.c. rose 1 each; in the Suburban and Provincial group, Croydon "A" and ditto "B" and "C" rose 15 each, Newcastle 1¼, South Suburban 1, ditto debenture 5, and Tynemouth 3. Among the rest, Continental Union preference rose 5, Imperial Continental debenture 3, Cape Town ½, Montevideo 1.

The following transactions in gas during the week were recorded: On Monday, Commercial 4 p.ct. 94, European 13, 14¼, 14⅛, 14½, Gas Light ordinary 93½, 94, 94¼, 94½, ditto preference 80⅜, ditto debenture 64, 65¼, 66, Imperial Continental 164, Primitiva preference 45s., ditto debenture 72, South Metropolitan 96, 96½, ditto 6½ p.ct. debenture 105⅜, South Suburban 101½, Tottenham debenture 80, Wandsworth "B" 97, 97⅛, Grays and Tilbury 10 p.ct. "A" 10, 10⅛, Swansea 7 p.ct. preference 101¼, 101½, 101⅜, 102, 102¼, ditto 6½ p.ct. debenture 104¼, 105, 105¼. On Tuesday, Bombay 4⅜, 4½, Brighton and Hove original 169⅜, 170, Commercial 4 p.ct. 94, ditto 3½ p.ct. 94¼, 94½, 94⅜, Continental Union 37, European 13⅛, 13½, Gas Light ordinary 93¼, 93½, 93⅜, 94, 94⅜, 94⅛, 94⅜, Imperial Continental 164, 164½, Primitiva debenture 73, South Metropolitan 96, 96¼, 96⅜, ditto 6½ p.ct. debenture 105¼, 106¼, South Suburban 101, 101½, ditto debenture 94, Wandsworth "B" 98½, Folkestone 59, Swansea 7 p.ct. preference 102, 102¼, ditto 6½ p.ct. debenture 104¼. On Wednesday, Bombay 4⅛, Commercial 4 p.ct. 93, 93½, Gas Light ordinary 93½, 93⅜, 94, ditto maximum 67, ditto debenture 65, Imperial Continental 164, 165½, Primitiva 15s. 1½d., South Metropolitan 96¼, 96⅜, ditto 6½ p.ct. debenture 106¼, South Suburban 100¼, 100½, Tottenham "B" 100, Swansea 7 p.ct. preference 102. On Thursday, Bombay 4⅜, Commercial 4 p.ct. 92½, European 12⅜, Gas Light ordinary 93¼, 93½, 93⅜, 94, 94¼, 94¼, ditto debenture 65, Imperial Continental debenture 79, Primitiva preference 45s., 46s. 3d., South Metropolitan 96¼, 96⅜, 97, ditto 6½ p.ct. debenture 105⅜, 105⅝, 106⅜, Tottenham "B" 99½, Swansea 7 p.ct. preference 102, 102½, St. Alban's 5 p.ct. 80. On Friday, Bombay 4⅜, Bournemouth 5 p.ct. 11⅛, Brentford "A" 90⅜, Commercial 4 p.ct. 93½, European £13 1s. 9d., Gas Light ordinary 94, 94¼, 94⅜, 94⅜, 95, 95⅛, 95⅛, 96, ditto preference 79½, Primitiva preference 46s. 3d., River Plate debenture 58⅛, San Paulo preference 5⅝, South Metropolitan 96½, 96⅝, ditto 6½ p.ct. debenture 105, 105⅜, Tottenham "A" 11⅜, Croydon 5 p.ct. maximum "D" 77, Grays and Tilbury "A" 10, Swansea 7 p.ct. preference 102, 102⅛, 102½, ditto 6½ p.ct. debenture 104⅜, 105¼.

In the Money Market, there was not much movement; but in mid week the demand was rather more pronounced, and then weakened up to the close. Discount rates hardened. The Bank rate is 4 p.ct., as fixed on April 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mch. 15	4	4%	Aldershot 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Apl. 12	2½	3 3/16%	Alliance & Dublin Ord.	59—64	62—67	...
374,000	,,	Jan. 12	4	4%	Do. 4 p.c. Deb.	76—79	62—67	...
280,000	5	May 18	7½	4/-	Bombay, Ltd.	5⅛—6⅛	4⅛—5	4⅛—4⅛
100,000	5	Feb. 23	16	7½%	Bournemouth Gas and Water { 5 p.c.	..	10½—11½	11½
383,110	10	,,	7	7%	B 7 p.c.	15—15⅛	9—10	...
115,000	10	,,	6	6%	Pref. 6 p.c.	13⅛—14	8—9	...
162,065	—	Dec. 30	—	4%	4 p.c. Deb.	..	65—70	...
992,045	Stk.	Feb. 9	14	56/-	Brentford A Consolid.	261—266	88—93	90⅞
734,920	,,	,,	11	55/-	Do. B New	204—209	88—93	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	80—85	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	75—80	...
214,775	,,	Mch. 15	11	11%	Brighton & Hove Orig.	208—213	165—170	169½—170
244,200	,,	,,	8	8%	Do. A Ord. Stk.	154—159	118—123	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	..	...
530,000	20	Mch. 15	12½	10%	British	44—45	29—31	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	78—82	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—60	...
100,000	10	June 1	—	7%	Cape Town & Dis., Ltd.	1⅛—2⅛	6⅛—7⅛*	...
100,000	10	Apl. 27	—	4½%	Do. 4½ p.c. Pref.	4—6	5⅛—6⅛	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	75—80	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	Mch. 15	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	91—96	92⅛—94
560,000	,,	,,	5⅛	38/4	Do. 3½ p.c. do.	103—105	92—97	94⅛—94⅜
475,000	,,	—	3	3%	Do. 3 p.c. Deb. Stk.	69⅛—71⅛	57—62	...
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	37—42	37
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	55—60	...
51,600	,,	Feb. 23	15	15%	Croydon A 10 p.c.	..	200—210	.
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	..	160—170	...
492,270	Stk.	—	6	4⅛%	Derby Con. Stk.	123—125	80	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	65	...
1,002,180	10	Jan. 26	10	5/0	European, Ltd.	17⅛—18	13—14	12⅛—14⅛
16,298,975	Stk.	Feb. 23	4/17/4	46/8	Gas Light and Coke { 4 p.c. Ord	98—102	94—97	93⅛—96
2,600,000	,,	,,	3½	35/-	3½ p.c. max.	76—79	65—68	67
4,062,255	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	80—83	79⅛—80⅛
4,674,850	,,	Dec. 15	3	3%	3 p.c. Con. Deb.	72⅛—74⅛	63—66	64—66
130,000	,,	Dec. 11	10	10%	10 p.c. Bonds	..	..	...
82,500	,,	Sept. 14	5	3⅛%	Hastings & St. L. 5 p.c.	..	..	...
258,740	,,	Mch. 15	3⅛	2⅛%	Do. 3½ p.c.	87—89	52—57	...
70,000	10	May 18	11	5%	Hongkong & China, Ltd.	16½—16⅝	6—7	...
86,600	Stk.	Mch. 15	9	9⅛%	Hornsey 7 p.c.	..	100—105	...
131,000	,,	,,	7⅛	7⅛%	Ilford A and C	151—154	120—130	...
65,780	,,	,,	6⅛	5⅛%	Do. B.	115—118	100—110	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	75—80	...
1,976,000	,,	May 18	9	5%	Imperial Continental	150—160	162—167	164—165⅛
404,800	,,	Feb. 9	3⅛	3⅛%	Do. 3½ p.c. Deb. Red.	84—86	75—80	79
235,242	,,	Mch. 15	6⅛	6⅛%	Lea Bridge Ord. 5 p.c.	119—121	83—88	...
2,498,903	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—213	..	...
					B.	146—148	..	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	...
165,736	,,	Feb. 23	7/5/6	6%	Maidstone 5 p.c.	..	80—85	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb	..	48—51	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4⅛—4⅜	2⅜—3⅜	...
250,000	100	Apl. 3	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	91—98	...
541,920	Stk.	June 1	4	4%	Monte Video, Ltd.	11⅛—12	63—68*	...
1,875,892	,,	Feb. 23	4½	4½%	Newcastle & Gatsh'dCon.	98⅛—99⅛	83—83⅛	...
529,705	,,	Dec. 30	3⅛	3⅛%	Do. 3½ p.c. Deb.	82—83	69—71	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	12⅜—13	...
55,940	10	Mch. 15	7/14/0	10/12	,, ,, 7 p.c.	14—15	10⅛—11⅛	...
300,000	Stk.	May 18	8	8%	Oriental, Ltd.	117—122	90—95	...
60,000	5	—	10	—	Ottoman, Ltd.	7⅛—7⅜	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonh'se 5 p.c.	..	69—71	...
60,000	50	Mch. 15	13	62/6	Portsea Island, B	128—131	87—90	...
100,000	50	,,	12	57/6	Do. C	118—121	78—83	...
249,980	5	—	8	—	Primitiva Ord.	5⅛—6	⅜—1	15/16
499,960	5	—	5	—	Do. 5 p.c. Pref.	4⅛—5	2⅛—2⅜	45/—46/3
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	68—73*	72—73
600,000	Stk.	Jan. 26	4	4%	Do. ,, ,, 1911	..	55—60	..
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	58⅜
150,000	10	Mch. 30	6	6/-	San Paulo { 6 p.c. Pref.	10⅛—11	5⅜—6⅜	5⅜
125,000	50	Jan. 3	5	5%	5 p.c. Deb.	47—49	36—39	...
133,000	Stk.	Mch. 15	10	5%	Sheffield A	223—224	89—92	...
209,984	,,	,,	10	5%	Do. B	222—224	89—92	...
523,500	,,	,,	10	5%	Do. C	220—222	89—92	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	Oct. 28	9	8%	South African	10⅛—11⅛	7—9	...
6,609,895	Stk.	Feb. 9	5/4/0	5%	South Met. Ord.	111—113	95—98	96—97
250,000	,,	Jan. 12	—	5%	Do. Red. Pref.	..	96—98	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72⅛—74⅛	60—63	...
224,820	,,	Feb. 23	8⅛	8⅛%	South Shields Con. Stk.	157—159	106—108	...
2,087,795	,,	,,	6	5⅛%	S'th Suburb'n Ord. 5 p.c.	114—116	98—103	100⅛—101⅛
368,837	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	95—100	94
647,740	,,	May 18	5	5%	Southampton Ord.	99—102	63—68	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	..	60—62	...
120,000	,,	Feb. 23	—	7½%	Tottenham { A 5 p.c.	135—138	112—117	114⅛
782,275	,,	,,	6	5⅛%	District { B 3½ p.c.	115—117	98—103	99⅛—100
181,255	,,	Dec. 15	4	4%	4 p.c. Deb.	87—89	77—82	80
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Mch. 15	5	3⅛%	Tynemouth 5 p.c. max.	108⅛—109	71—73	...
30,000	,,	Mch. 15	8⅛	66/3	Wandsworth, Wimbledon, and Epsom— Wandsworth A 4 p.c.	151—156	110—115	...
255,636	,,	,,	6⅛	51/3	Do. B 3½ p.c.	129—134	95—100	97—98⅛
108,075	,,	,,	—	46/4⅛	Do. C	..	85—90	...
140,865	,,	,,	—	46/4⅛	New Ordinary	..	85—90	...
352,000	,,	,,	6⅛	45/-	Wimbledon 5 p.c.	117—122	90—95	...
98,000	,,	,,	6⅛	50/-	Epsom 5 p.c.	121—126	93—98	...
88,416	,,	Dec. 30	3	3%	3 p.c Deb. Stk.	66—69	57—60	...

* Ex Div.

STOCKS AND SHARES.

WELLINGTON (SALOP) GAS COMPANY.

INCORPORATED BY ACT OF PARLIAMENT.

ISSUE OF £18,500

6½ P.CT. REDEEMABLE PREFERENCE STOCK

(MINIMUM PRICE OF ISSUE, £100 PER £100 STOCK).

REDEEMABLE AT PAR, JUNE 30, 1932.

THE Directors of the Wellington (Salop) Gas Company are prepared to receive, not later than Friday, June 9, 1922, TENDERS for the above Stock.

Tenders, which must be for not less than £50 of Stock and in multiples of £10, should be made on the prescribed Form, addressed to the undersigned, and endorsed "Tender for Preference Stock."

Copies of the Prospectus and Form of Tender can be obtained on Application to me or to the Manager at the Company's Offices, Market Street, Wellington, Salop.

R. A. NEWILL,
Secretary and Solicitor.

Church Street, Wellington,
Salop.

By Order of the Directors.

NEW ISSUE OF CAPITAL.

THE RUGBY GAS COMPANY.

MESSRS. A. & W. RICHARDS are Instructed to offer for SALE BY TENDER such an amount of

6 PER CENT. REDEEMABLE PREFERENCE STOCK

as will produce the net sum of £25,000.

MINIMUM PRICE OF ISSUE - £97 per £100.

The Stock to be redeemed at par on the 1st of July, 1932.

The yield at the Minimum Price, allowing for profit on redemption, is £6 9s. 2d. per cent.

Prospectus and Form of Tender (which latter must be sent in by 11 o'clock on Tuesday, June 20, 1922) may be obtained at the COMPANY'S OFFICES, RAILWAY TERRACE, RUGBY, and of Messrs. A. & W. RICHARDS, 87, WALBROOK, LONDON, E.C. 4.

Association of Statutory Inspectors of Gas-Meters.—Our report of the annual meeting of the Association, in Manchester last Thursday, is unavoidably held over until the next issue of the "JOURNAL."

Kells Gas Supply.—At an inquiry conducted by Mr. Ryan, an Inspector of the Irish Provisional Government, into a proposed scheme of public electric lighting, it was complained that the Gas Company did not give satisfaction. The price was 15s. per 1000 c ft. Mr. John Robinson (Secretary of the Gas Company) said he had received no official intimation from the Urban Council of the inquiry, and had not had time to prepare a statement. The Town Clerk (Mr. Connell) said he did not think there was any obligation to give special notice, as the inquiry was announced generally. Mr. S. Brennan (the Chairman of the Urban District Council) pointed out that the Secretary of the Gas Company had no authority from his Directors to appear; and Mr. Robinson informed the Inspector that he could not say what action the Directors would take.

Meters, Ltd.—At the twenty-fifth ordinary general meeting, to be held in Manchester on Thursday, the 15th inst., the Directors will submit the accounts for the year ended March 31. After providing for interest on debenture stock (less tax), general management expenses, Directors' fees, legal charges, expenses on patents, income-tax, repairs and renewals, and depreciation upon buildings, machinery, and plant, the net profit amounts to £28 973, which, added to the balance of £6874 brought forward, gives a total of £35,847. After deducting the interim dividends, the amount now available for appropriation is £29 822; and the Directors recommend the payment of final dividends for the year at the rate of 5½ p.ct. per annum upon the preference shares, and at the rate of 12 p.ct. per annum upon the ordinary shares (which will make the ordinary dividend 8½ p.ct. for the year, less tax); the payment of a bonus of 4d. per share (free of income-tax) upon the ordinary shares; that the sum of £5000 be added to the reserve fund (making that fund £128,000); that £695 be added to the staff benevolent fund (making that fund £5000); and that the balance of £9573 be carried forward to next year's account, subject to corporation profits tax.

Gas or Electricity for Tramway Routes.—In the Edinburgh Town Council, the question of lighting Princes Street, in connection with the electric tramway lines shortly to be laid down, was discussed. Mr. Stewart urged that an opportunity should be given the Gas Committee to estimate for the lighting. He considered they could use gas in place of electricity with advantage in the matter of cost. There had recently been developments in high-pressure gas lighting, which was now in advance of electricity. Mr. Mancor said that, while gas might be cheaper, the ordinary upkeep and maintenance was much more expensive than electricity. If they adopted gas, they would be compelled by the Board of Trade to put up triple insulators. It would be an objectionable feature to have these insulators for the sake of using gas. Mr. Baxter thought it was absurd to talk about three insulators at 2d. each. There were fifty towns in Scotland which had their tramway routes lighted with gas. If they wanted to spend £1000 in lighting when they could do it for £500, it was all right; but the public should know. The cost of lighting by gas would include all maintenance. It was agreed to remit the matter back to the Committee, to consider as to whether gas or electricity should be adopted for lighting.

Gas Department's Loss at Walsall.—In the figures announced in the various accounts submitted to the Walsall Town Council in committee last week, on municipal trading for the year ended March 31, the gas undertaking shows a net loss of £3177. By the sale of gas last year, the Committee realized an income of £128,129, of which sum £880 was in respect of street lighting and £1424 from other Corporation consumers. In the previous year, the total income by sales of gas was £135 905. Stove-rentals, &c., brought in £7619, as against £9062; and the sale of residual products, £44,035, as against £61,950. Expenditure charged to the manufacture of gas amounted to £116,311, as against £141,087; distribution charges totalled £26,867; and management, insurance, and other items brought the expenditure up to £181,280. The loss of £3177 follows a loss of £6289 for the previous year; but in a report accompanying the accounts the Committee state that, having regard to the anxious period through which gas undertakings generally have passed, they do not consider the result unsatisfactory. They also point out that, in consequence of trade depression, the amount realized by the sale of residuals shows a great reduction, and that there has been a loss because of the small amount received for public lighting. "The financial results which have been obtained during the last six months," the Committee add, "have been of an encouraging character." Notwithstanding this loss, the Committee consider that, in view of the falling cost of labour, coal, and other materials, a reduction in lighting charges can be made; and they have therefore given instructions for the price of gas supplied for lighting purposes after the June meter readings to be reduced from 4s. 9d. to 4s. 6d. per 1000 c.ft. in the borough, and by 4d. per 1000 c.ft. for consumers outside, who will then be paying an extra 9d. per 1000 c.ft.

Malta and Mediterranean Gas Company, Ltd.—At the annual meeting on Tuesday, the 20th inst., the Directors will report that, after appropriating the sum of £5869 to reserve, £1000 for corporation profits tax, and £1000 for deferred repairs, the amount standing to the credit of profit and loss account is £11,453. The Directors propose to pay a dividend of 7 p.ct. (less tax) on the first preference shares, of 7½ p ct. (less tax) on the second preference shares, and of 6 p.ct. (free of tax) on the ordinary shares for the year, leaving a balance of £3498 to be carried forward. No money has yet been received from the Italian Government on account of the claim made against them for the losses sustained in carrying on the works at Trapani and Marsala during the war.

Cheaper Gas at Brighton.—Notice is given by Mr. C. H. Rutter, the Engineer and General Manager of the Brighton and Hove General Gas Company, that, as from the date of reading the meter indices for the period ending Midsummer next, the price of gas will be reduced to all consumers by ½d. per therm. On the basis of the declared value of the gas to be supplied by the Company as from July 1 next—viz., 500 B.Th U. per cubic foot—this reduction is the equivalent of 2½d. per 1000 c.ft. As each cubic foot of gas will contain an increased heat value, it will be necessary in some districts to readjust the price mechanism of the meters for those customers using shilling or penny slot-meters. As a result of the increased thermal efficiency, less gas will be needed for every lighting, heating, and cooking operation.

The price of gas in Longford has been reduced from 12s. 6d. to 10s. per 1000 c.ft.

In the Chorley Town Council, a fortnight ago, Alderman Heald (the Chairman of the Gas Committee) said the financial statement of the department showed a loss on the year of only £256, against £2088 the previous year.

Recently Messrs. A. & W. Richards offered £20,000 of 6½ p.ct. redeemable stock to tender on behalf of the Hayward's Heath District Gas Company. The issue was over-subscribed; the tenders ranging from £103½ down to the minimum of par.

While a street main of the Drighlington Gas Company was being tested for an escape last week, an explosion occurred and a manhole lid, weighing about 30 lbs., was blown up, breaking a telegraph wire, and smashing several causeway flags in its fall. Fortunately nobody was injured.

The Grassmoor Company have informed the Chesterfield Corporation that they are prepared to supply gas above the quantity prescribed by the existing agreement at 1s. 3d. per 1000 c.ft., with a sliding-scale based on a rise or fall in the price of coal. The Gas Committee have declined to pay more than a basic price of 1s. 1d. per 1000 c.ft.

The tenders sent in for the £39,590 of 6 p.ct. debenture stock in the Grays and Tilbury Gas Company, issued by Messrs. A. & W. Richards, amounted to a total of £69,370, and ranged from £105 down to the minimum of par. The stock was allotted at an average price of £101 10s. 4d. p.ct., at which the yield to the investor is £5 15s. 7d. p.ct.

The Blackburn Gas Committee have decided that estimates, amounting to £28,000, for additions to the contract for the erection of new vertical retorts at the Greenbank Gas-Works, and for increases in the prices of materials and labour in connection with such contract, be approved and submitted to the Finance Committee. A further estimate of £10,000, for the purchase of a station meter, turbo-exhausters, and condensing and washing plant at these works, was also approved.

The members of the Portsea Island Gas Light Company's Social and Athletic Club celebrated last Thursday, by a dinner and Bohemian concert, the successes attending their last football season. Mr. T. H. F. Lapthorn, J.P., presided. Mr. P. Hayward submitted the toast of "The Chairman, Directors, Engineer, and Secretary of the Gas Company." He thanked them for their invaluable support to the Club, and observed that to get men socially contented was a long way on the road to industrial content, which was essential to the wellbeing of the country. He specially thanked the Engineer (Mr. T. Carmichael) for his extreme interest. Mr. Lapthorn acknowledged on behalf of the Board the thanks of Mr. Hayward. They recognized that there was in a man's life something apart from his daily work—a side in which he was entitled to get some pleasure and recreation. The Board gladly did what they could to provide a ground; and as long as the present Board remained, the Club were certain of warm interest and ungrudging support. Mr. Carmichael also returned thanks, and congratulated both football teams upon their successes. They had made three records. The first team had won the Portsmouth Senior League championship at the first time of asking; the second team won the North End League shield; and the double event constituted the third record. The Secretary of the Club (Mr. S. Blandford) was described as "a marvel." The toast of "The Club" was proposed by Mr. D. A. Halliday, and responded to by the President (Mr. D. T. Marwick).

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

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[No. 00277 of 1922

In the High Court of Justice.

CHANCERY DIVISION.

MR. JUSTICE ASTBURY.

IN THE MATTER OF THE HARWICH GAS & COKE COMPANY LIMITED

AND

IN THE MATTER OF THE COMPANIES (CONSOLIDATION) ACT 1908.

NOTICE IS HEREBY GIVEN that a Petition was on the 17th May, 1922, presented to His Majesty's High Court of Justice by the above-named Company to confirm an alteration of the Company's objects proposed to be effected by a Special Resolution of the said Company passed at an extraordinary general meeting of the Company held on the 4th April, 1922, and confirmed at an extraordinary general meeting of the Company held on the 22nd April, 1922, and which resolution was in the words and figures following :—

"That the Memorandum and Articles of Association submitted to this meeting be and the same are hereby approved and that pursuant to the provisions of section 264 of the Companies (Consolidation) Act 1908 the form of the Company's constitution be altered by substituting such Memorandum of Association with extended objects as therein set forth and such Articles of Association for the Company's Deed of Settlement dated the 31st day of March 1854 and for all the regulations of the Company subsequently made and now in force and that the Directors be and they are hereby authorized to apply to the Court to confirm this resolution under the said Act."

The following is a copy of the said proposed Memorandum of Association that is to say :—

1. The name of the Company is "The Harwich Gas and Coke Company Ltd."

2. The registered office of the Company will be situate in England.

3. The objects for which the Company are established are :—

(A) Subject to the provisions of the Harwich Gas Orders 1874 to 1921 to make supply and sell gas and other heat light and illuminating power in the Parish of St. Nicholas Harwich (including the town of Harwich) in the County of Essex and in the Parishes of Dovercourt and Ramsey in the same County (hereinafter called the "limits of supply") and to manufacture sell and dispose of the coke and other residual products arising from the materials used in the manufacture of gas.

(B) To maintain and continue on the land described in the Schedule to the Harwich Gas Order 1874 and on any other lands which the Company may for the time being be authorized to utilize in that behalf under any Order or Orders for the time being in force and from time to time to alter and enlarge retorts gas holders receivers purifiers meters apparatus and works for the manufacture and storing of gas and of coke and other residual products obtained in the manufacture of gas and matters producible therefrom; and to manufacture coal tar coke pitch asphaltum and ammoniacal liquor oil and other residual products obtained in the manufacture of gas and matters producible therefrom and to sell and dispose of the same at the works of the Company and elsewhere.

(C) To carry out perform and observe all the duties and obligations imposed on the Company by the Harwich Gas Orders 1874 to 1921 and to exercise and enjoy all the rights powers and privileges conferred on the Company by the said Orders.

(D) To purchase or take on lease dwelling-houses for any of the Company's employees and offices and show rooms for the purposes of its undertaking and to erect fit up maintain and let any such building on any lands for the time being belonging to or leased by the Company.

(E) With the consent of the owner of the soil and on the application of the owner or occupier of any premises within the limits of supply abutting on or being erected in any street laid out but not dedicated to public use to supply such premises with gas and so that for those purposes the Gas Works Clauses Act 1847 shall apply as if Section 7 of that Act were excepted from incorporation in the Harwich Gas Orders 1874 to 1921.

(F) To lay down, repair, alter, remove and renew mains pipes and culverts in any street within the limits of supply for the purpose of procuring conducting or disposing of any oil or other materials used by the Company in or resulting from the manufacture of gas or any residual products thereof or for any purposes connected with the Company's undertaking and so that the provisions of the Gas Works Clauses Act 1847 with respect to the breaking up of streets for the purpose of laying pipes and for the protection of pipes when laid so far as they are applicable for the purposes of this paragraph shall extend and apply *mutatis mutandis* to and for the purposes thereof.

(G) To erect construct lay down enlarge alter and maintain any buildings works machinery or other conveniences necessary or useful for the Company's business.

(H) To borrow or raise or secure the payment of money for the purpose of the Company's business and with a view thereto to mortgage and charge the undertaking and all or any of the real and personal property present or future and all or any of the uncalled capital for the time being of the Company, and to issue at par or at a premium or discount debentures or debenture stock payable to bearer or otherwise and either permanent or redeemable and collaterally or further to secure any securities of the Company by a trust deed or other assurance. Provided always that the amount of all moneys borrowed by the Company after the 17th August 1921 and secured by Mortgage of the undertaking and the rate of interest payable thereon shall not at any time exceed the limits prescribed by the Harwich Gas Order 1921 or any other Gas Order for the time being in force and affecting the Company.

(I) To receive money on deposit by way of security for the payment of moneys due in respect of any supply of gas heat light or illuminating power or the purchase or hire of any meter and to pay interest thereon as provided by the Harwich Gas Order 1874.

(J) To make superannuation and other allowances and to pay pensions or gratuities to any officers servants or employees of the Company who may be temporarily or permanently disabled by sickness infirmity or age and for that purpose to apply the funds and revenue of the Company.

(K) To subscribe or make donations to infirmaries and hospitals which are within the limits of supply and to convalescent homes and similar institutions and to the benevolent and sick funds of the employees of the Company and for any of those purposes to apply the funds and revenues of the Company.

(L) To invest and deal with the moneys of the Company not immediately required upon such securities and in such manner as may from time to time be determined.

(M) To pay for any property or rights acquired by the Company either in cash or shares with or without preferred rights in respect of dividend or repayment of capital or otherwise or by any securities which the Company has power to issue and partly in one mode and partly in another and generally on such terms as the Company may determine.

(N) Subject to and with the benefit of the provisions of Section 27 of the Harwich Gas Order 1921 to purchase sell let for hire fix repair and remove but not to manufacture engines stoves ranges pipes and other fittings for lighting motive heating ventilating cooking or for any other purposes and to provide all materials and work necessary or proper in that behalf and with respect thereto to demand and take such remuneration or rents and charges and make such terms and conditions as may be agreed upon.

(O) To take receive and contract for a supply of gas in bulk from any local authority company or persons authorized to supply gas under Parliamentary powers in any district adjoining the limits of supply.

(P) To contract with any local authority company or persons for the supply to them respectively of gas in bulk upon such terms and conditions and for such periods not exceeding in any case seven years from the making of the contract as may be agreed upon but so that the Company is not to be at liberty to lay any mains or interfere with any street beyond the limits of supply.

(Q) Subject to the provisions of the Harwich Gas Orders 1874 to 1921 to sell improve manage develop turn to account deal with or dispose of the undertaking of the Company or any part thereof and all or any of the property and assets for the time being of the Company.

(R) To do all or any of the above things as principals agents trustees contractors or otherwise and either by or through agents subcontractors trustees or otherwise.

(S) To do all such other things as are incidental or conducive to the above objects or any of them.

4. The liability of the members is limited.

5. The share capital of the Company is £36,000 divided into 7200 shares of £5 each whereof 2400 shares constitute the original share capital of the Company and 4800 shares constitute the additional share capital authorized by the Harwich Gas Order 1874 and the Harwich Gas Order 1902 respectively.

And NOTICE IS HEREBY FURTHER GIVEN that the said Petition is directed to be heard before His Lordship Mr. Justice Astbury on Tuesday the 27th day of June 1922. Any person interested in the said Company whether as a creditor or shareholder or otherwise desirous of opposing the making of an Order for the confirmation of the said alteration of the Company's objects under the above Act should appear at the time of hearing personally or by Counsel for that purpose. A copy of the Petition will be furnished to any such person requiring the same by the undersigned Company's Solicitors on payment of the regulated charge for the same.

Dated 6th June 1922.

SHARPE, PRITCHARD, & CO.,
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